ADDENDUM

JANUARY 1, 2006

CHANGES TO PART I

When conditions prevent a vertical separation of 18 inches, the following shall be used:

1. Sewers passing over or under water mains shall be in accordance with Item 2 above.

2. Water mains passing under sanitary sewers shall, in addition, be protected by providing:

   A. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.

   B. Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking of the water mains.

   C. A section of water pipe centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

Where the sanitary sewer is installed parallel to a storm drainage structure, there shall be at least 10 feet horizontally, measured center to center, between them.

Design of sanitary sewer lines and laterals as it relates to sidewalks must be designed to accommodate at least a 10 foot horizontal separation between the County's public sewer mains. If sidewalks are designed within the public road right-of-way, the end of the sewer lateral must be designed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater. If sidewalks are designed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the end of the sewer lateral must be designed 3 feet behind the house side of the sidewalk. If the sidewalks are designed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the sewer services must be designed within 1 foot outside of the right-of-way line.

Carrier pipe within bores for sanitary sewer installation shall be Ductile Iron (Class 52) and is to be used from manhole to manhole. C-900 PVC DR-18 pipe (Class 150) may be used as an option, provided there are no proposed or future house laterals connected directly into this pipe.

All sanitary sewer line crossings of railroads and, where required, roadways, and other major structures shall be encased in a casing pipe. Design of railroad crossings shall comply with the requirements of American Railway Engineering Association Specifications, Part 5 - Pipelines (latest revisions). The engineer shall be responsible for the preparation of the necessary application, at least 180 days in advance of construction or advertisement for bid, for submission by the County to the railroad or in a timely fashion as determined by the Department and/or the Engineer.

Ductile iron pipe (Class 52) shall be used when crossing storm sewer and other rigid underground conduits when the vertical separation is 18" or less.

The tops of all sewers entering or crossing streams shall be a sufficient depth below the natural bottom of the streambed to protect the sewer line. In general, one foot of suitable cover shall be provided where the stream is located in rock and three feet of suitable cover in other material. Less cover will be considered if the proposed sewer crossing is encased in concrete and/or ductile iron pipe is used and will not interfere with future improvements to the stream channel.

All sewer pipe within a 100 year backwater where cover is less than 3.0 feet shall be of non-float pipe. Other anti-flotation methods or devices will be considered on an individual basis.

Clay dams shall be utilized where the possibility exists that ground or surface water will follow the sewer trench, causing damage or undermining of pipe bedding.

In paved channels, the top of the sewer lines shall be placed at least 18" below the bottom of the channel pavement.

Sanitary sewers constructed in fill shall be of ductile iron pipe (Class 52) with manholes founded on original ground unless a licensed geotechnical engineer can furnish a certification that the fill has been sufficiently compacted so that settlement of the sewer or manhole will not occur. Such certification shall apply to that area directly above as well as below the pipe.

Sanitary sewers shall remain fully operational during the 100 year flood. Sewers and their appurtenances located along streams shall be protected against the normal range of high and low water conditions, including the 100 year flood. Sewers located along streams shall be located outside of the streambed and sufficiently removed therefrom to provide for future possible channel widening.

Sewers entering or crossing streams, estuaries, lakes, or reservoirs shall be constructed of watertight pipe. The pipe and joints shall be tested in place and shall exhibit zero infiltration. Sewers laid on piers across ravines or streams shall be allowed only when it can be demonstrated that not other practical alternative exists. Such sewers on piers shall be constructed in accordance with the requirements for sewers entering or crossing under streams. Construction methods and materials of construction shall be such that sewers will remain watertight and free from change in alignment or grade due to anticipated hydraulic and physical loads, erosion, and impact.

In cases where sanitary sewers are to be constructed on steep grades and velocities greater than 15 feet per second are indicated, solid wall PVC pipe or other abrasion resistant material shall be used.

In addition, sewers laid on a slope of 20 percent or greater shall be anchored securely with concrete anchors or other approved means. Suggested minimum anchorage is as follows but should be determined by the engineer:

1. Not over 36 feet center to center on grades 20 percent to 35 percent.

2. Not over 24 feet center to center on grades 35 percent to 50 percent.

3. Not over 16 feet center to center on grades 50 percent and over.

DEPTH OF SANITARY SEWER LINES

All sewer lines within existing or proposed streets or areas subject to traffic shall be so constructed as to provide a minimum cover of 6' over the pipe. Greater depths shall be required to serve low properties, where street grades may be lowered in the future, where there is a possibility of further extension of the sewer line, or where clearance must be provided for other utilities. Clearance shall be provided for enlargement of undersized drainage structures.
Minimum cover for sewer lines in easements shall be 3.5 feet.

SANITARY SEWER MANHOLES:

Manholes shall be constructed in accordance with Chesterfield County standards and details.

Manholes shall be located at the end of each line, at all changes in pipe size, alignment (except where laid on a curve where diameter is larger than 24"), grade and at sewer junctions. Maximum spacing between manholes on straight runs shall be 400 feet for sewers 15 inches or less and 500 feet for sewers 18 inches and larger.

Manholes subject to flooding shall be easily accessible and have watertight manhole covers. All manhole rims shall be 6 inches above the 100 year flood elevation, except where the rim would be more than 4 feet above the existing grade in which case watertight covers shall be used and manhole be set at a height 4 feet above final grade.

Drop manholes shall be used when the spring line elevation of the incoming sewer line exceeds the spring line elevation of the outgoing sewer line by 2' or more. Unvented sections of sewer shall not exceed 1,000 feet in length.

Sampling manholes shall be provided for all Significant Industrial Users (SIU) and any facilities discharging over 25,000 gal/day of non domestic wastewater, which includes industrial facilities, food processing, metal processing, hospitals, animal hospitals, photographic finishers, printing shops, etc.

Physical design of the sampling point must be appropriate for the type of wastewater to be sampled.

For further information, contact the Industrial Waste Pretreatment Section.

SERVICE CONNECTIONS

Service connections shall be provided in accordance with existing County ordinances, specifications and details. Plugged service connections are to be provided when required by the Department of Public Utilities for all lots and parcels within the new development. A minimum size of 6" diameter pipe is required for sewer lateral connections.

Sanitary sewage force mains shall be ductile iron (Class 52) or approved equal. A higher class if the design parameters require a thicker pipe. For 12" and smaller, PVC C-900 or other approved water type pipe may be used. Force mains to be designed with a minimum flow velocity of 3.0 feet per second, a maximum flow velocity of 8.0 feet per second; and a Hazen-Williams "C" value of 120. Minimum size shall be 4 inches in diameter. A constant grade shall be used where feasible. Minimum ground cover shall be same as required for water lines or deeper where necessary to accommodate water services and/or future water lines, etc. Valves and air releases will be provided at appropriate locations.

Manholes receiving the discharge from force mains shall be designed in accordance with the County's standard details. In addition, special acid-resistant manholes and sewer pipe shall be provided downstream of the discharge point as determined by the engineer (hydrogen sulfide calculations are required). On existing systems, manholes shall receive an approved liner. Liner shall be as shown in the standard details.

WATER PUMP STATIONS

Water pump stations shall be considered a special project and specific project standards and plans will be prepared by the Engineer and submitted to the County for review and approval. The project standards shall include but not limited to contents as set forth in Appendix 9.

WATER LINE LOCATION

Generally, water lines to be installed in proposed subdivision and local streets shall be located 2 feet off the edge of pavement where there is no curb and gutter and 4 feet in front of the face of curb (pavement side) where there is. However, within proposed curb and gutter streets, an alternate design should be considered if right-of-way is available and a design is feasible. Water lines to be installed along existing roads will generally be installed in easements where the road is likely to be widened in the future and in the right of way where the road will not be widened in the future.

Design of water mains and water meter boxes as it relates to sidewalks must be designed to accommodate at least a 4 foot horizontal separation between the County’s public water mains. If sidewalks are designed within the public road right-of-way, the street side of all water meter boxes must be designed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater. If sidewalks are designed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the street side of all water meter boxes must be designed 3 feet behind the house side of the sidewalk. If the sidewalks are designed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the water services must be designed within 1 foot outside of the right-of-way line.

Where water lines are to be installed in roads expected to be widened in the future, they shall be located in easements unless the future road cross section is known and location of water line is designed to avoid future relocation.

Water lines shall be designed so that changes in alignment are made with bends with approved thrust blocks or approved mechanical joint restraint systems wherever applicable. All mechanical joint thrust restraint system calculations to be shown on plans with a detail sketch showing length of pipe and fittings to be restrained. See Part V for additional specifications and requirements. Where it is necessary to change alignment by deflecting successive lengths of pipe, the joint deflection shall be limited to the allowable deflection according to standard details) in Part II of this manual, which represents one-half the maximum allowable by most manufacturers. For PVC pipe, the deflection is made by curving the pipe, since there is no deflection capability in the joints. The bending radius shall be limited as per standard detail (s) in Part II of this manual.

Bending and joint deflection limits apply to vertical as well as horizontal curves. Engineer is to verify existing field conditions to develop soil classifications for calculated bearing pressures.

The engineer must design the system to ensure that the maximum deflection can be accomplished, however, fittings may be necessary and the engineer shall make this determination during design.

In subdivisions, water mains will be permitted in easements only when there is no other feasible alternative and prior approval is obtained from the Department of Public Utilities. Easements shall be wide enough to provide sufficient space for both installation and maintenance.

The engineer shall consider the location of existing and proposed sanitary sewer and storm drainage systems and all other underground structures and utilities that could affect the location and type of materials for the pipeline. The selected location should avoid conflicts and facilitate future maintenance.

Where the possibility of conflicts with existing utilities and/or other structures exist, it shall be the Engineer's responsibility to secure accurate information on the exact horizontal and vertical location of such utilities through subsurface exploration and reflect this exact information on the plans.

The engineer shall consider the requirement for separation of water and sanitary sewer facilities and shall use the same requirements stated in the **SANITARY SEWER LOCATION** section of these standards.

Water main crossings of railroads and where required, roadways shall be encased in a casing pipe. Design of railroad crossings shall comply with the requirements of American Railway Engineering Association Specifications, Part 5 - Pipelines (latest revisions). The engineer shall be responsible for the preparation of the necessary application, at least 180 days in advance of construction or advertisement for bid, for submission by the County to the railroad or in a timely fashion as determined by the Department and/or Engineer.

Water mains entering or crossing streams, shall be Ductile Iron Pipe (minimum Class 52). The tops of these mains shall be a sufficient depth below the natural bottom of the streambed to protect the pipe. In general, 3.5 feet of suitable cover is required. The pipe and joints shall be designed, constructed, and protected against anticipated hydraulic and physical, longitudinal, vertical, horizontal loads, erosion and impact. Reasons for requesting less cover shall be given in writing to the County prior to plan submittal. Water mains constructed in fill shall be Ductile Iron Pipe (Class 52) with restrained joints unless a licensed geotechnical engineer can furnish a certification that the fill has been compacted so that settlement of the main will not occur. Such certification shall apply to the area directly above as well as below the pipe.

Water mains constructed on piers will be permitted only when it can be demonstrated that no other practical alternative exists. The engineer shall submit a design for the piers, pier foundation and pipe that will demonstrate the structural integrity of the proposed system.

Above ground pipe shall be adequately supported, protected from damage from freezing, accessible for repair or replacement and above the 100 year flood elevation.

Subaqueous water main installations will be permitted only when it can be demonstrated that no other practical alternative exists. The pipe shall be of special construction having flexible watertight joints. Special attention shall be directed to foundation conditions for the pipe and to thrust resistance.

For both the above ground and subaqueous crossings the design shall provide:

Valves at both ends of the crossing so that the section can be isolated for tests and repairs. The valves shall be easily accessible and not subject to flooding.

DEPTH OF WATER LINES

Standard Minimum cover will be 42 inches. All water lines shall be constructed to a depth that will provide protection against freezing and thawing, insure adequate cover over valves and other appurtenances and provide service. New installation of water lines adjacent to road ways shall have a minimum of 42 inches of cover from existing/proposed edge of pavement. Greater depths shall be required where street grades will possibly be lowered in the future. Clearance shall be provided for enlargement of undersized drainage structures. Any development which takes place over an existing water main shall be required to maintain the water main at a maximum depth of 10' below finished grade. Where the depth exceeds 10' the water main shall be raised to the standard minimum depth of 42".

WATER LINE APPURTENANCES

Valve manholes, air relief valves, fire hydrants, service lines and other appurtenances shall be constructed in accordance with Chesterfield County standards and details.

Hydrants in residential areas should be located at corners or in mid-block at lot lines as approved by the Fire Department. Maximum hydrant spacing shall be 1,000 feet and no more than 500 feet to any house. When cul-de-sacs are longer than 500', the last fire hydrant shall be designed immediately before the bulb of the cul-de-sac, where practical. The developer is to make the necessary improvements to satisfy fire flow demands as determined and required by Fire Administration. The developer or his agent must follow the procedures as outlined in Appendix 14.

Valves shall be located at not over 1,000 foot intervals and at all changes in pipe diameter. Valves shall also be provided at all pipe line intersections so as to provide shut off for repairs of limited sections without interruption of service to large areas and to facilitate testing. A minimum of two valves shall be provided at tees, three valves at crosses and shall-be located as close to the fitting as practical. All Valves are to be restrained to fittings by approved method.

When connecting to an existing water main, installing a tee as opposed to a tapping sleeve and valve is especially desirable when there are long distances between main line valves (greater than 1,000 feet) or even if the distance is less than 1,000 feet where it would be an advantage to add a main line valve for better system control. Therefore, it is important that each project be carefully evaluated by the developer's engineer with the Department of Public Utilities' assistance to determine if a main line valve is needed and/or cutting in a tee is practical, taking into consideration how many residences, businesses, hospitals, etc. may be without water.

Water mains shall be provided with air release valves and blowoffs at suitable locations to allow testing, chlorination and draining of the line. Fire hydrants, blowoffs or flushing hydrants shall be installed at dead- end mains.

STRUCTURAL DESIGN

Structural requirements must be considered in the design of all water mains and appurtenances. This is a matter of detail design and is not subject to simple generalization. The following criteria should be considered by the design engineer:

1. Special Structures - Structures shall be built as shown in the standard details, however, structures other than those shown in the standard details shall be considered special structures and shall be designed and detailed by the design engineer and submitted for review and approval to the Department of Public Utilities prior to plan submittal or brought to the Department's attention at the time of plan submittal.

2. Pipe Foundation - In all cases the proper strength water pipe shall be specified for the proposed depth, width of trench and bedding condition. Soil condition should be considered with samples being obtained where necessary to verify pipe selection and foundation design.

SIZING WATER SERVICE LINES AND METERS
DEPARTMENT OF UTILITIES CHESTERFIELD COUNTY, VIRGINIA

Business Name:	Address of Building:	
Development Name:	Project Number	Type of Use _____ Map I.D. No. _____

I certify that the information on this form is true and correct.
Applicant Name (Print) _____ Phone # _____
(Signature) _____ (Local Phone # Desired)

****

PART A Fixture		Fixture Value 35 psi		No. of Fixtures		Fixture Value
Bathtub		8	x	_____	=	_____
Bedpan Washers		10	x	_____	=	_____
Combination Sink and Tray		3	x	_____	=	_____
Dental Unit		1	x	_____	=	_____
Dental Lavatory		2	x	_____	=	_____
Drinking Fountain	- Cooler	1	x	_____	=	_____
	- Public	2	x	_____	=	_____
Kitchen Sink	- ½" Connection	3	x	_____	=	_____
	- ¾" Connection	7	x	_____	=	_____
Lavatory	- ⅜" Connection	2	x	_____	=	_____
	- ½" Connection	4	x	_____	=	_____
Laundry Tray	- ½" Connection	3	x	_____	=	_____
	- ¾" Connection	7	x	_____	=	_____
Shower Head (Shower Only)		4	x	_____	=	_____
Service Sink	- ½" Connection	3	x	_____	=	_____
	- ¾" Connection	7	x	_____	=	_____
Urinal	- Pedestal Flush Valve	35	x	_____	=	_____
	- Wall Flush Valve	12	x	_____	=	_____
	- Trough (2 Ft. Unit)	2	x	_____	=	_____
Wash Sink (Each Set of Faucets)		4	x	_____	=	_____
Water Closet	- Flush Valve	35	x	_____	=	_____
	- Tank Type	3	x	_____	=	_____
Dishwasher	- ½" Connection	5	x	_____	=	_____
	- ¾" Connection	10	x	_____	=	_____
Washing Machine	- ½" Connection	5	x	_____	=	_____
	- ¾" Connection	12	x	_____	=	_____
	- 1" Connection	25	x	_____	=	_____
Hose Connection (Wash Down)	- ½"	6	x	_____	=	_____
	- ¾"	10	x	_____	=	_____
Hose (50 Ft. Wash Down)	- ½"	6	x	_____	=	_____
	- ⅝"	9	x	_____	=	_____
	- ¾"	12	x	_____	=	_____

Combined Fixture Value Total = =========

********** - OR - **********

PART B
(1) Domestic Demand (Verification by County Staff - See Conversion Table) = _____gpm
(2) Fixed Demand (To include all demands except for domestic & irrigation) = _____gpm
(3) Irrigation Demand (From Data Supplied by Site Engineer) = _____gpm
(4) Total Demand = _____gpm
(5) Meter Size based on Total Demand
(Verification by Co. Staff - Use Water Meter Sizing Table) = ==========

****

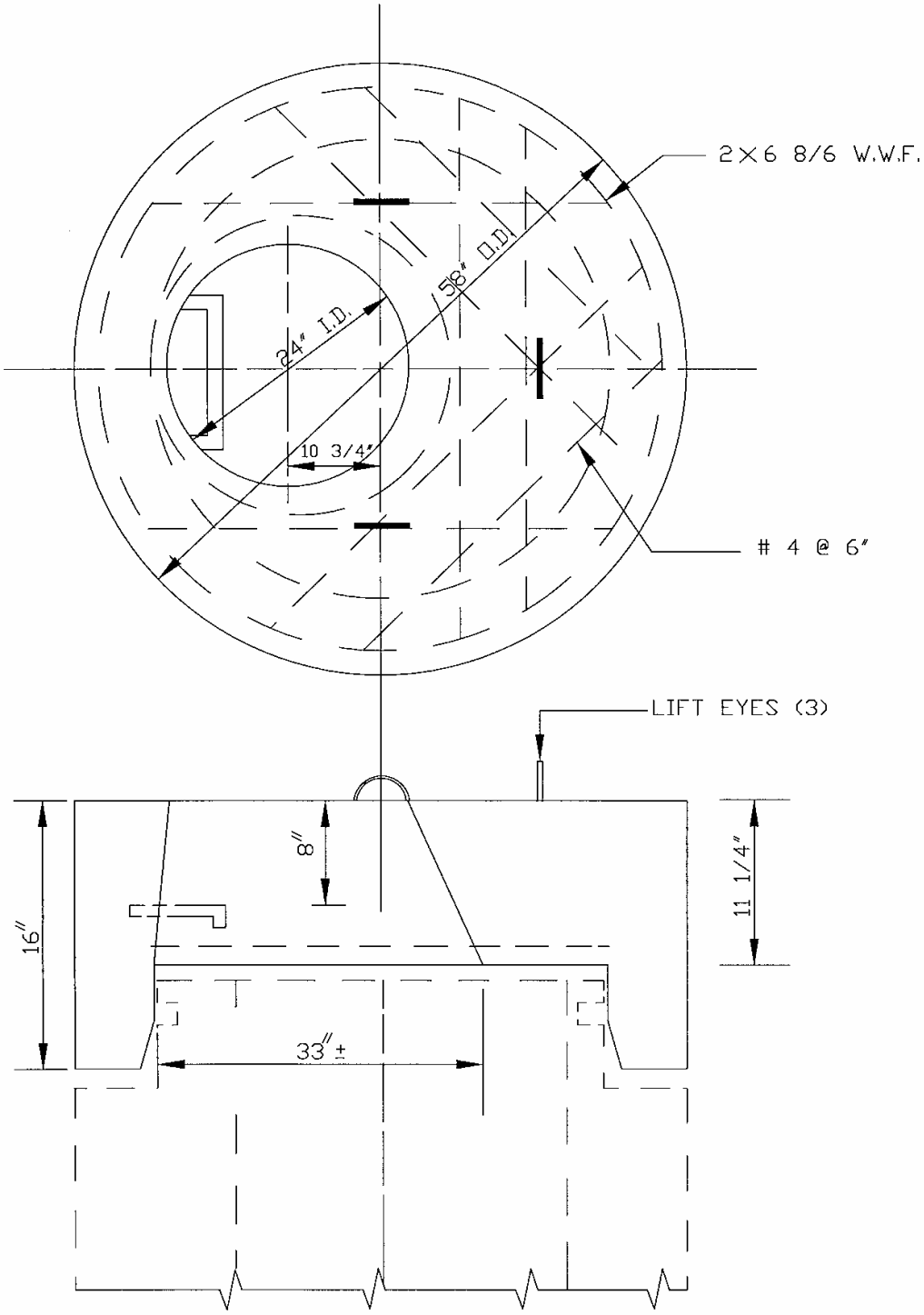
COUNTY USE ONLY Node No. _____ Actual Meter Size _____ Virtual Meter Size _____
Sized By _____ Date _____ Sewer _____

ADDENDUM

JANUARY 1, 2006

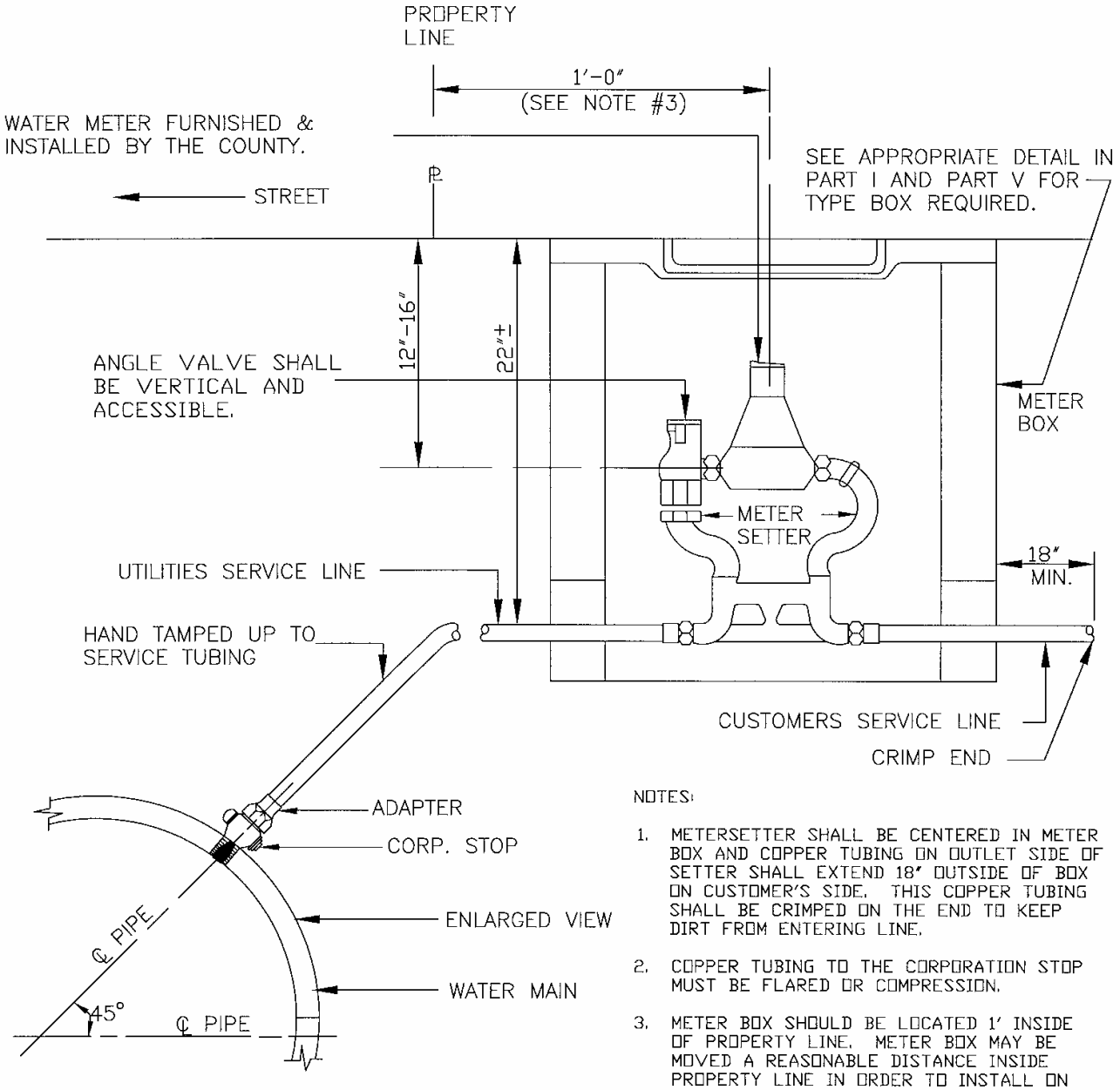
CHANGES TO PART II

CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES



DATE	1′ – 4″ FLAT TOP CONE (TYPE 2)	DRWG. NO.
JAN. 1996		MAN–15
REVISIONS JAN. 2006		

CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES



SADDLE MUST BE USED IF TAP IS MADE IN PVC OR A/C PIPE.

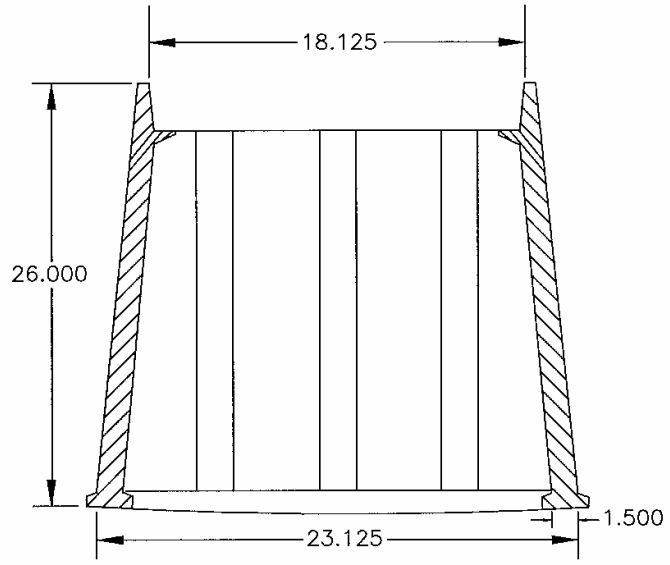
NOTES:

1. METERSETTER SHALL BE CENTERED IN METER BOX AND COPPER TUBING ON OUTLET SIDE OF SETTER SHALL EXTEND 18" OUTSIDE OF BOX ON CUSTOMER'S SIDE. THIS COPPER TUBING SHALL BE CRIMPED ON THE END TO KEEP DIRT FROM ENTERING LINE.
2. COPPER TUBING TO THE CORPORATION STOP MUST BE FLARED OR COMPRESSION.
3. METER BOX SHOULD BE LOCATED 1' INSIDE OF PROPERTY LINE. METER BOX MAY BE MOVED A REASONABLE DISTANCE INSIDE PROPERTY LINE IN ORDER TO INSTALL ON REASONABLY LEVEL GROUND.
4. SERVICES SHALL BE INSTALLED PRIOR TO TESTING.
5. BYPASS SHALL NOT BE ALLOWED FOR 5/8" OR 1" RESIDENTIAL AND IRRIGATION METERS.

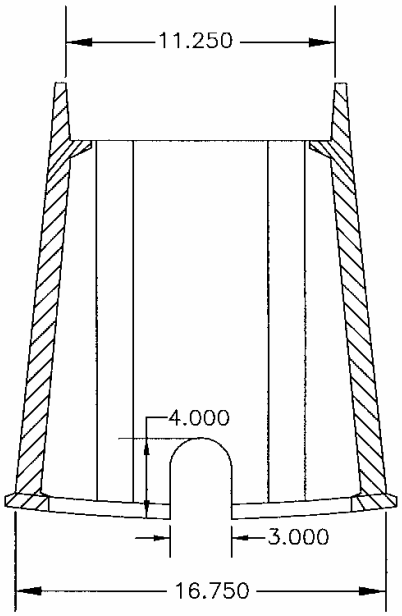
DATE JAN. 1996	TYPICAL WATER METER CONNECTION FOR 3/4" & 1" SERVICES (5/8" AND 1" METERS)	DRWG. NO. MET-1
REVISIONS JAN. 2006		

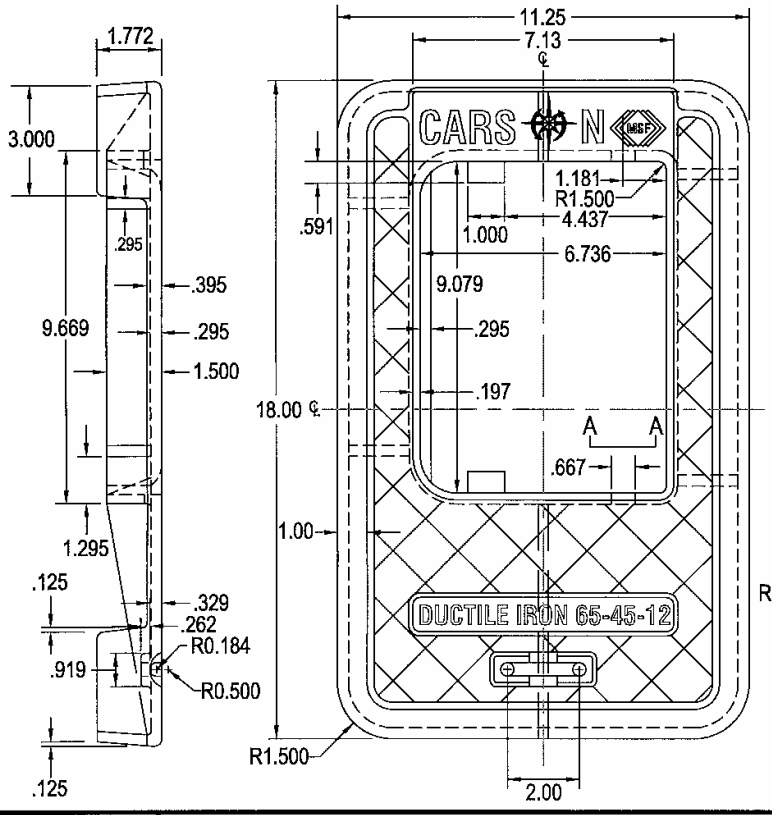
CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES

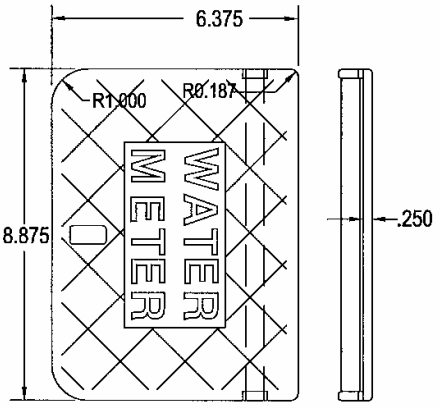
LONG SIDE VIEW

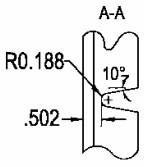


SHORT SIDE VIEW









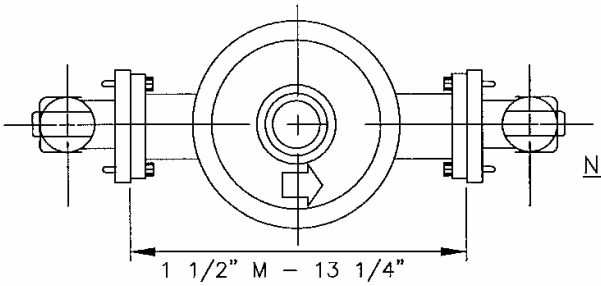
NOTE:
ALL THE EDGES MUST BE ROUNDED WITH A RADIUS VALUE EQUAL TO 0.187, AS LONG AS THE THICKNESS OF THE WALL ALLOWS IT. OTHERWISE THIS VALUE SHOULD BE ADJUSTED TO THE SPECIFIED THICKNESS.

DATE	**PLASTIC METER BOX (1" METERS)**	DRWG. NO.
JAN. 1996		MET–5
REVISIONS JAN. 2006		

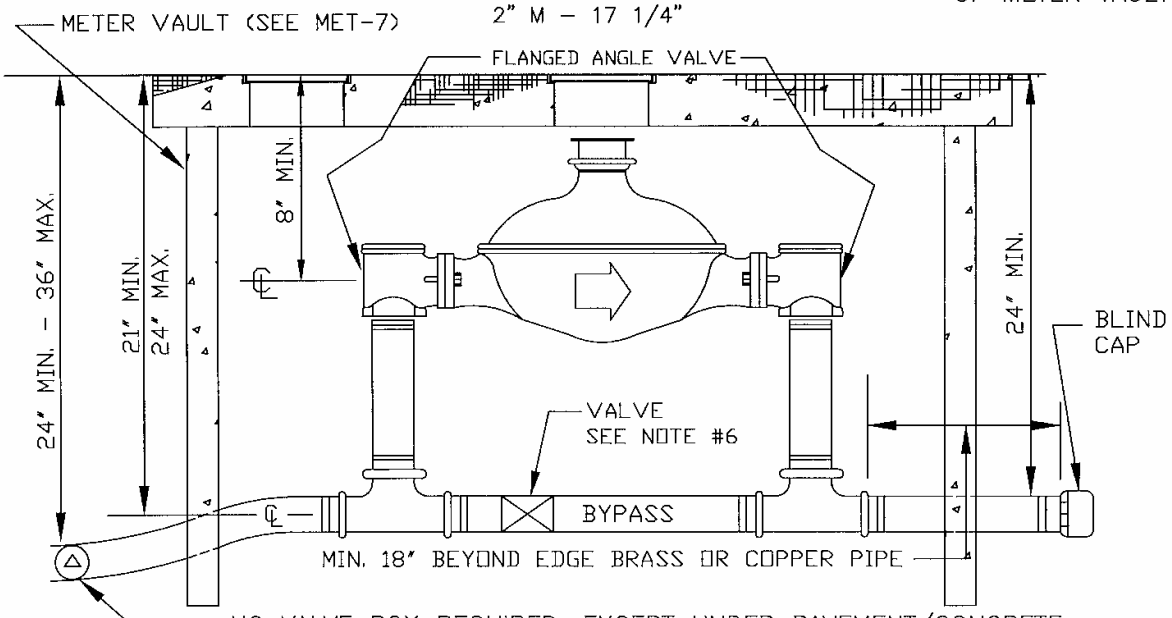
CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES

NOTES:

1. SADDLES SHALL BE USED FOR ALL 1 1/2" AND 2" TAPS.
2. WATER SERVICE LATERALS FOR 1 1/2" AND 2" SERVICES WILL BE TYPE-K HARD COPPER. CONNECTIONS FOR 1 1/2" AND 2" SERVICES WILL BE SWEAT 95/5 (LEADLESS) SOLDER AND A SUITABLE FLUX; APPROVED COMPRESSION FITTINGS; OR A ProPress SYSTEM. ALL CONNECTIONS AT CORPORATION STOPS WILL BE APPROVED COMPRESSION FITTINGS.
3. TAPS SHOULD BE MADE AT THE SPRING LINE OF THE MAIN LINE.
4. FOR DETAIL OF VAULT, SEE MET-7.
5. YOKE MUST BE INSTALLED WITH A METER SPACER THAT WILL BE FURNISHED TO THE CONTRACTOR BY THE UTILITIES DEPARTMENT INSPECTOR. THE SPACER WILL BE REMOVED BY THE UTILITIES DEPARTMENT WHEN THE METER IS SET.
6. BY-PASS VALVE SHALL NOT BE ALLOWED FOR IRRIGATION OR RESIDENTIAL SERVICES. ALL 1 1/2" AND 2" METER SETTERS FOR DOMESTIC USE AT RESIDENTIAL HOMES, CONDOMINIUMS, APARTMENTS, TOWNHOUSES, EXT. SHALL NOT BE EQUIPPED WITH A BYPASS VALVE. SETTERS FOR IRRIGATION USES SHALL NOT BE EQUIPPED WITH A BYPASS VALVE. ALL OTHER 1 1/2" AND 2" METER SETTERS SHALL BE EQUIPPED WITH A BYPASS.



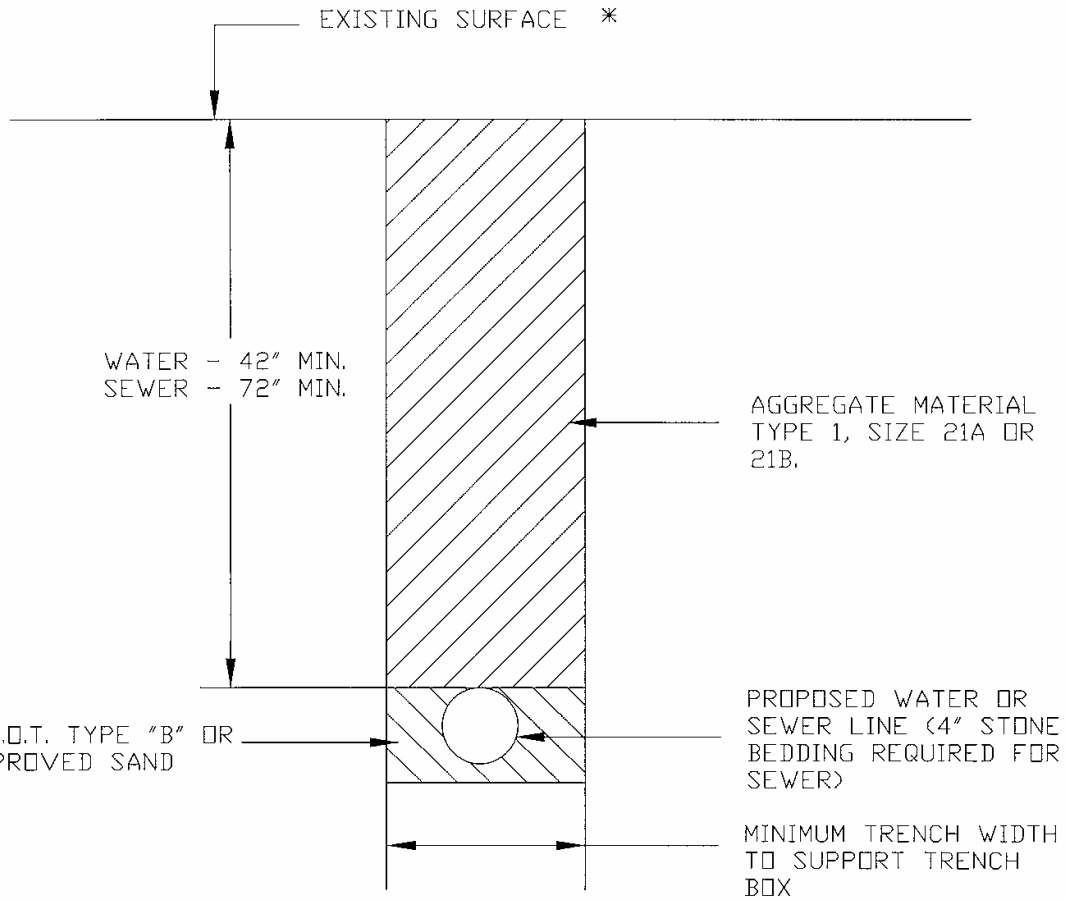
NOTE: BYPASS SHALL BE LOCATED ABOVE OR AT FLOOR LEVEL OF METER VAULT.



NO VALVE BOX REQUIRED, EXCEPT UNDER PAVEMENT/CONCRETE. CURB STOP OUTSIDE OF BOXMUST BE LOCATED WITHIN 1 FOOT EDGE OF METER BOX.

DATE: JAN. 1996	1 1/2" OR 2" DISC METER SETTINGS	DRWG. NO. MET-6
REVISIONS: JAN. 2006		

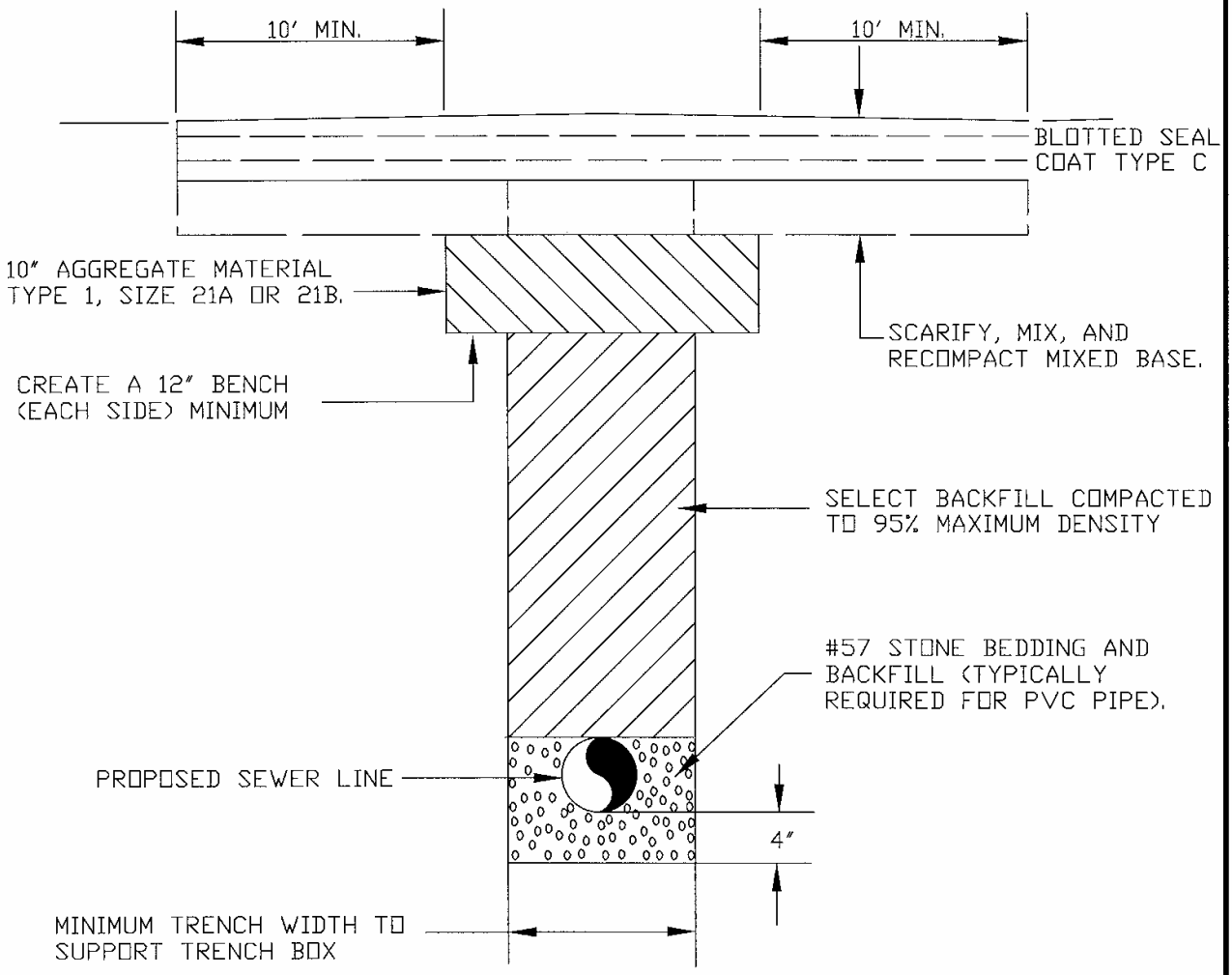
CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES
VDOT APPROVED



* NOTE: CAPPING DONE ON SHOULDERS, GRAVEL AND DIRT ROADS.

DATE JAN. 1996	TYPICAL SECTION FOR REPAIR OF "PRIMARY" ROADWAY SHOULDERS OR OTHER UNPAVED TRAVELED AREAS FOR WATER & SEWER LINE CROSSINGS	DRWG. NO. PAV-1
REVISIONS JAN. 2006		

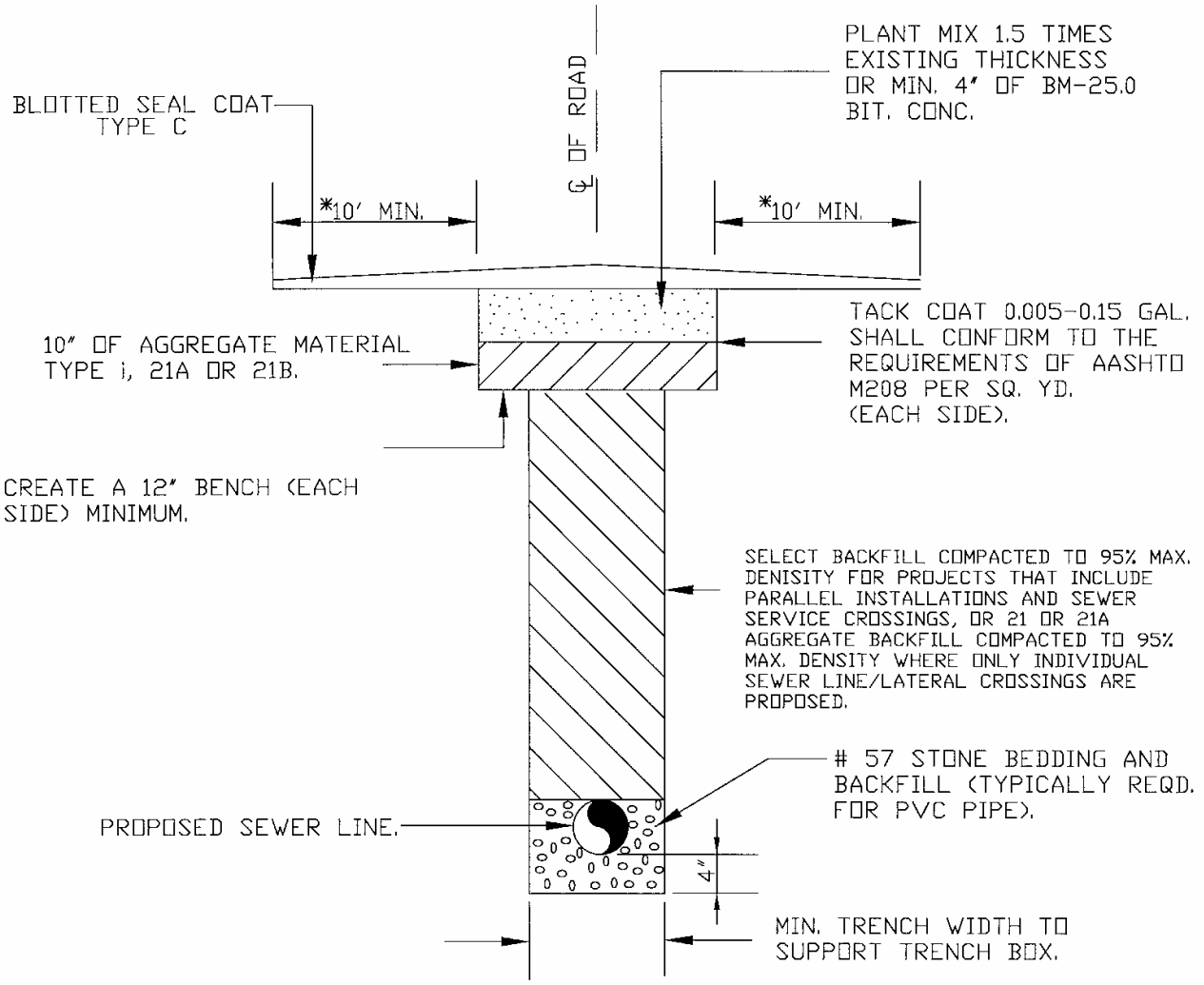
CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES
VDOT APPROVED



SURFACE - BLOTTED SEAL COAT TYPE C: THE INITIAL SEAL AND FINAL SEAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M208 @ 0.17 GAL./SQ. YD. WITH 15 LBS. OF NO 8P STONE/SQ. YD. EACH. THE BLOT SEAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M208 @ 0.15 GAL./SQ. YD. WITH 10 LBS. OF FINE AGGREGATE GRADE B SAND PER SQ. YD.

DATE JAN. 1996	TYPICAL SECTION FOR REPAIR OF OPEN CUT AFTER PLACEMENT OF SEWER IN SURFACE TREATED ROAD WHERE A BASE (EXCEPT CONCRETE OR PLANT MIX) IS PRESENT	DRWG. NO. PAV-2
REVISIONS JAN. 2006		

CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES
VDOT APPROVED

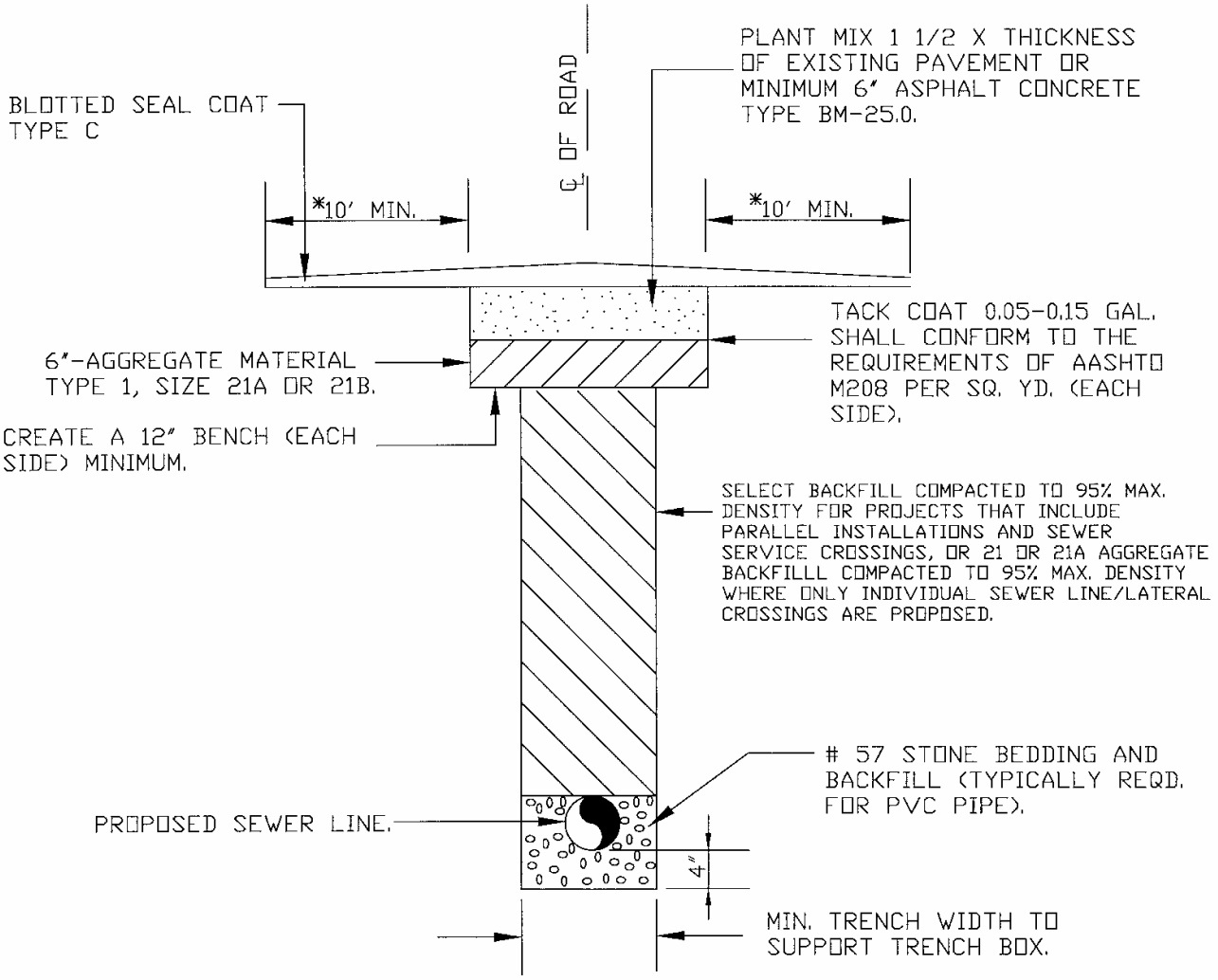


* REPLACEMENT OF PAVEMENT SHALL BE FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT.

SURFACE - BLOTTED SEAL COAT TYPE C: THE INITIAL SEAL AND FINAL SEAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M208 @ 0.17 GAL./SQ. YD. WITH 15 LBS. OF NO 8P STONE/SQ. YD. EACH. THE BLOT SEAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M208 @ 0.15 GAL/SQ. YD. WITH 10 LBS. OF FINE AGGREGATE GRADE B SAND PER SQ. YD.

DATE JAN. 1996 REVISIONS JAN. 2006	TYPICAL SECTION FOR REPAIR OF OPEN CUT AFTER PLACEMENT OF SEWER IN SURFACE TREATED ROAD (APPLIES TO PARALLEL INSTALLATION & SERVICE CROSSINGS)	DRWG. NO. PAV-3

CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES
VDOT APPROVED

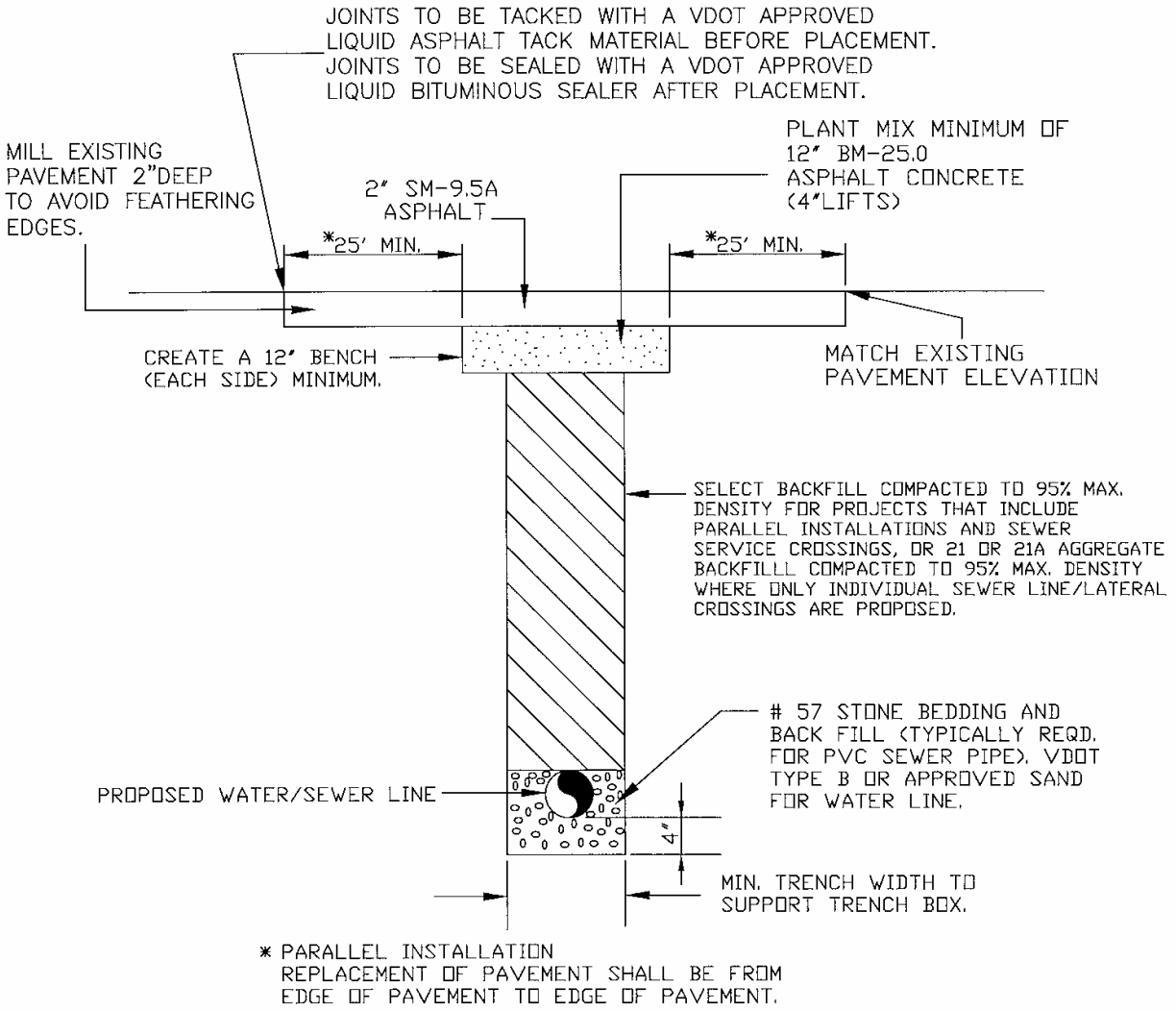


* REPLACEMENT OF PAVEMENT SHALL BE FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT.

SURFACE-BLOTTED SEAL COAT TYPE C: THE INITIAL SEAL AND FINAL SEAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M208 @ 0.17 GAL./SQ. YD. WITH 15 LBS. OF NO. 8P STONE/SQ. YD. EACH. THE BLOT SEAL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M208 @ 0.15 GAL./SQ. YD. WITH 10 LBS. OF FINE AGGREGATE GRADE B SAND PER SQ. YD.

DATE JAN. 1996	TYPICAL SECTION FOR REPAIR OF OPEN CUT AFTER PLACEMENT OF SEWER IN SURFACE TREATED ROAD WHERE A PLANT MIX OR CONCRETE BASE IS PRESENT APPLIES TO PARALLEL AND SERVICE CROSSINGS)	DRWG. NO. PAV-4
REVISIONS JAN. 2006		

CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES
VDOT APPROVED



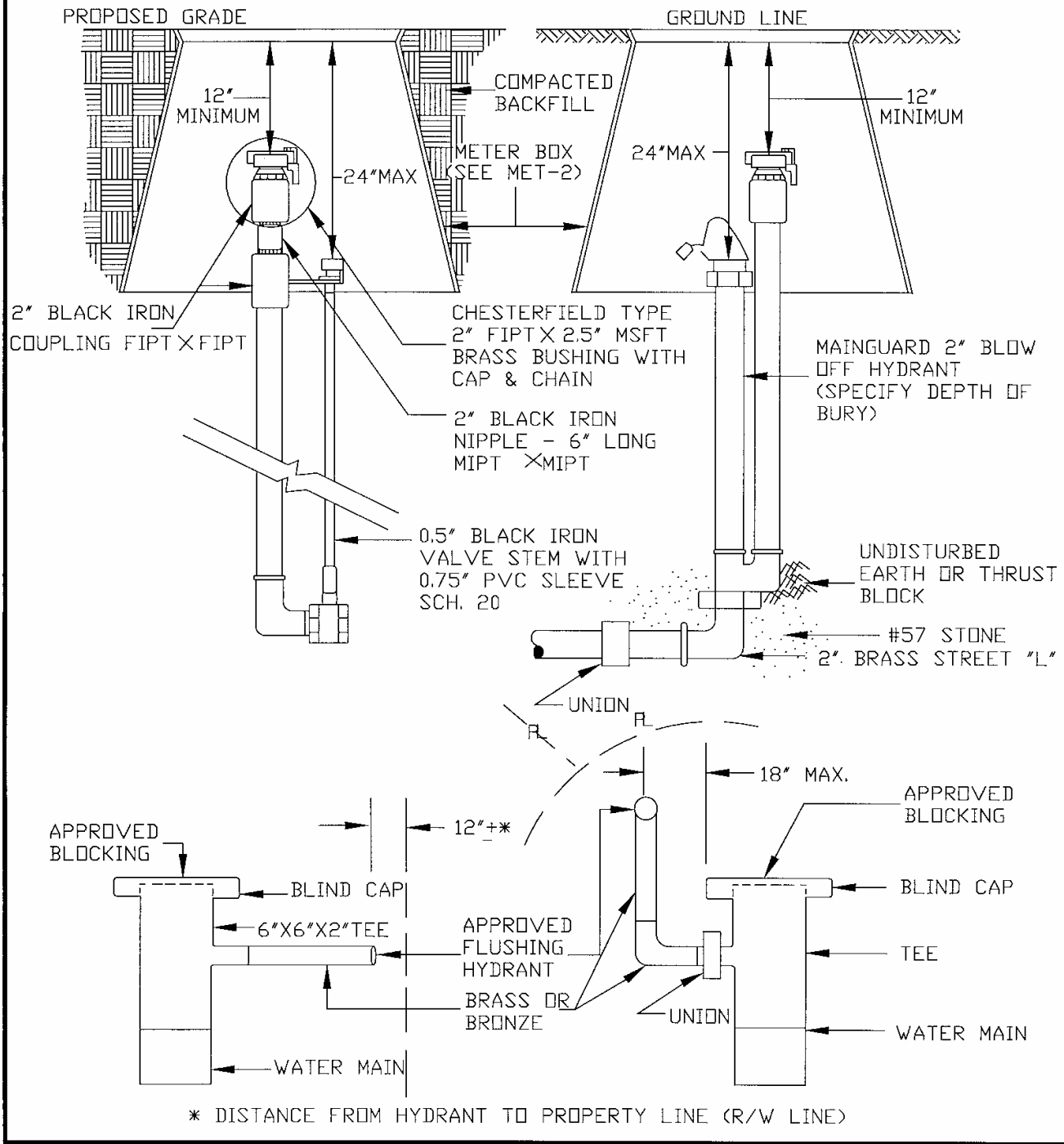
* PARALLEL INSTALLATION REPLACEMENT OF PAVEMENT SHALL BE FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT.

DATE: JAN. 1996 REVISIONS: JAN. 2006	TYPICAL SECTION FOR REPAIR OF OPEN CUT AFTER PLACEMENT OF WATER AND SEWER LINES IN PLANT MIX ROADS	DRWG. NO. PAV-5

CHESTERFIELD COUNTY
DEPARTMENT OF PUBLIC UTILITIES

AQUARIUS 103 CHESTERFIELD 2"
FLUSHING HYDRANT PART #CHSFLD30

INSTALLATION DETAIL MAINGUARD
78 BLOW-OFF HYDRANT (MODIFIED)



* DISTANCE FROM HYDRANT TO PROPERTY LINE (R/W LINE)

DATE	FLUSHING HYDRANT (BLOW-OFF)	DRWG. NO.
JAN. 1996		WAT-3
REVISIONS JAN. 2006		

ADDENDUM

JANUARY 1, 2006

CHANGES TO PART III

PART III

COUNTY
WATER AND SEWER PROJECT
CONSTRUCTION SPECIFICATIONS
CHESTERFIELD COUNTY, VIRGINIA

***INSTRUCTIONS* for viewing and/or printing this document:**
To view PART III, click on the blue highlighted area above. After pulling up PART III, click on "**BOOKMARKS**" in the left hand margin of the document to locate various sections within the document. To print the document in its entirety, click FILE – PRINT. (When printing the document, please remember to print this table of contents and include it in your book.)

TABLE OF CONTENTS

INSTRUCTIONS TO BIDDERS

1. **DATE AND PLACE OF BID OPENING.** Sealed bids on behalf of the County of Chesterfield, Virginia, will be received at the office of the Director of Purchasing, Room 402, Fourth Floor, Chesterfield Administration Building, 9901 Lori Road Chesterfield, Virginia 23832 until but no later than _____ local time prevailing, _____, 2_____, and then publicly opened and read immediately thereafter for the following:

   _____

   The Chesterfield County Contract No. for this project_____. Drawings and specifications which include the proposal form may be obtained from_____(Engineer and Address)_____for $_____. Drawings and specifications are nonrefundable.

   Time is of the essence and any bid received after the announced time and date for submittal, whether by mail or otherwise, will be rejected. The time of receipt shall be determined by the time clock stamp in the Purchasing Department. Bidders are responsible for ensuring that their bids are stamped by Purchasing Department personnel before the deadline indicated. Late bids received will be so noted in the bid file in order that the vendor's name will not be removed from the subject commodity/service list.

2. **CERTIFICATE OF REGISTRATION.** If a contract for construction, removal, repair or improvement of a building or other real property is for Seventy Thousand Dollars ($70,000) or more, or if the total value of all such contracts undertaken by Bidder within any twelve-month period is Five Hundred Thousand Dollars ($500,000) or more, the Bidder is required under Title 54.1, Code of Virginia (1950), as amended, to be licensed by the State Board of Contractors as a "CLASS A CONTRACTOR". If such a contract is for Seventy-five Hundred Dollars ($7,500) or more [One Thousand Dollars ($1,000) for electrical, plumbing and HVAC work] but less than Seventy Thousand Dollars ($70,000), the Bidder is required to be licensed as a "CLASS B CONTRACTOR". If such a contract is for One Thousand Dollars ($1,000) or more but less than Seventy-five Hundred Dollars ($7,500) and is not for electrical, plumbing and HVAC work, the Bidder is required to be licensed as a "CLASS C CONTRACTOR". The Contractor license shall have the appropriate specialty classification that is predominant for the respective work. The Bidder shall indicate in the space provided whichever of the following notations is appropriate, inserting his contractor license number and specialty.

Licensed Class A Virginia Contractor No. _____
Specialty _____

Licensed Class B Virginia Contractor No. _____
Specialty _____

Licensed Class C Virginia Contractor No. _____
Specialty _____

If the Bidder shall fail to provide this information on his bid or on the envelope containing the bid and shall fail to promptly provide said Contractor license number to the County in writing when requested to do so before or after the opening of Bids, he shall be deemed to be in violation of Section 54.1-1115 of the Code of Virginia (1950), as amended, and his bid will not be considered.

If a Bidder shall fail to obtain the required license prior to submission of his bid, the bid shall not be considered.

3. **RESPONSIBILITY OF BIDDER.** The Bidder shall make a careful examination of the project site, shall familiarize himself with existing conditions, and shall satisfy himself as to the quantity and quality of materials and workmanship required for the Work. He shall carefully and thoroughly examine the Plans, General Conditions, Technical Specifications, Bid Form, Agreement and Forms of Bonds before submitting a Bid.

Request for interpretation of plans and specifications should be sent to the Engineer to be given consideration and must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instruction will be in the form of written addenda to the specifications which, if issued, will be mailed to all prospective bidders (at the respective addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

The county is committed to increasing the opportunities for participation of minority business enterprises, woman-owned businesses and businesses located in Chesterfield County to ensure diversity in its procurement and contract activities. These businesses are encouraged to respond to all Invitations for Bids and Requests for Proposals. In addition, the county strongly encourages each contractor and/or supplier with which the county contracts to actively solicit minority business enterprises, woman-owned businesses and businesses located in the county as subcontractors/suppliers for their projects.

Upon award of the contract, the successful bidder shall furnish data requested on the Certification of Subcontractor/Supplier Activity form included in this IFB document. This information will enable the county to document the dollar level of activity and measure the success of its purchasing and contracting efforts in this endeavor.

19. DEFINITIONS. For purposes of Chesterfield County's classification and reporting program, in cooperation with the Virginia Department of Minority Business Enterprise, the following definitions apply:

Woman-Owned Business (WOB) - a business concern that is majority owned by a woman who also controls and operates the business. In this context, "control" means exercising the power to make policy decisions, and "operate" means being actively involved in the day-to-day management.

Minority Business Enterprise (MBE) - a business enterprise that is owned and controlled by one or more socially and economically disadvantaged persons. Such disadvantage may arise from cultural, racial, chronic economic circumstances or background or other similar cause. Such persons include, but are not limited to: African Americans, Asian Americans, Native Americans, Eskimos and Aleuts. (Reference: 2.1-6432.1 of the *Code of Virginia*)

Chesterfield Business (CB) – any private business enterprise, located within the jurisdictional boundaries of Chesterfield County.

Minority - a person who is a citizen of the United States or a legal resident alien and who satisfies one or more of the following:

20. OFFICE CLOSURE. In the event that Chesterfield County government offices are closed due to inclement weather and/or emergency situations at the time set aside for a pre-bid meeting and/or the published bid opening, the pre-bid meeting and/or bid opening date will default to the next open business day at the same time.

The following form will be sent to the contractor by the Purchasing Department for completion at the time of award, as appropriate.

CERTIFICATION OF ACTIVITY OF MINORITY BUSINESS ENTERPRISES, WOMAN-OWNED BUSINESSES, AND CHESTERFIELD BUSINESSES WHO ARE SUBCONTRACTORS/SUPPLIERS FOR THIS PROJECT/CONTRACT

Contractors shall furnish the information requested below regarding subcontractor(s) or supplier(s).

Name and Address of Subcontractor/Supplier	(√) MBE	(√) WOB	(√) CB	Commodity or Service	Dollar Amount

If a continuation of this list of subcontractors/suppliers is needed, please attach additional pages to this form.

I have no MBE, WOB or CB applicable to this contract _____(√)

Contractor hereby certifies that the above information is correct.

Complete Legal Name of Firm: _____ Date:_____
(Type or Print)

Form Prepared By:_____

Project Name/Number:_____

The undersigned Bidder agrees to begin the work not later than ten (10) days after the date specified in the Notice to Proceed and to prosecute the work in such manner as to complete it within the time limit as set forth above. In the event the said work is not completed within the time limit above stated, Bidder shall be liable and hereby agrees to pay the Owner as liquidated damages and not as a penalty the sum of $_____ dollars per calendar day for each and every day that the said work remains incomplete after the expiration of the substantial completion date and $_____ dollars per calendar day for each and every day that the said work remains incomplete after the expiration of the Final completion date.

If the bid from the lowest responsible bidder exceeds available funds, the County may negotiate with the low bidder to obtain a contract price within available funds.

Va. Contractor No. _____/Class _____/Specialty_____/Dated_____

If determined to be the successful low bidder(s), and the project cost exceeds $200,000, the above signed elects to utilize the escrow account procedure, a copy of which will be furnished with the contract.

_____
Write "yes" or "No"
on above line

The County reserves the right not to withhold retainage.

In the event the successful bidder elects to use the escrow account procedure, the "Escrow Agreement" form shall be executed and submitted to the County of Chesterfield Purchasing Department within fifteen (15) calendar days after notification. If the "Escrow Agreement" form is not submitted within the fifteen-day period, the contractor shall forfeit his rights to the use of the escrow account procedure.

Award of this bid shall be based upon

_____

_____

CERTIFICATION OF NON-COLLUSION AND SIGNATURE SHEET
This sheet must be signed and submitted with bid in order for bid to be considered.

My signature below certifies:

- I agree to abide by all conditions of this Bid and that I am authorized to sign this Bid.

- The accompanying bid is not the result of or affected by, any act of collusion with another person or company engaged in the same line of business or commerce, or any act of fraud punishable under, Chapter 12, Title 18.2, 498.4 of the *Code of Virginia*, 1950, as amended. Furthermore, I understand that fraudulent and collusive bidding is a crime under the Virginia Governmental Frauds Act, the Virginia Government Bid Rigging Act, the Virginia Anti-Trust Act, and Federal Law and can result in fines, prison sentences, and civil damage awards.

- The accompanying bid is in compliance with the *State and Local Government Conflict of Interests Act* 2.2-3100, supplemented by Article 6, 2.2-4367-69 of the *Code of Virginia*. Specifically, no county employee, county employee's partner, or any member of the county employee's immediate family holds a position with the bidder, offeror, or contractor such as an officer, director, trustee, partner or the like, or is employed in a capacity involving personal and substantial participation in the procurement transaction, or owns or controls an interest of more than five per cent.

Complete Legal Name of Firm: _____

Check One: ____ **Individual** ____ **Partnership** ____ **Corporation**

Order From Address: _____

_____

Remit To Address: _____

_____

Signature: _____

Name (type/print): _____ **Title:** _____

Fed ID No.: _____ **Phone (____)** _____ **Fax (____)** _____

We hereby provide the following information to Chesterfield County regarding our business. We understand that it is provided for statistical purposes only and all firms submitting bids will receive equal consideration.

Minority Business Enterprise: **Yes** _____ **No** _____

Woman-Owned Business: **Yes** _____ **No** _____

Chesterfield Business: **Yes** _____ **No** _____

TYPICAL BID FORM

(Example Only - Engineers shall prepare a standard bid proposal for each project using this typical bid form as a guideline.)

FOR
WATER PROJECTS

CONTRACT NUMBER _____

Item No. and Estimated Quantity	Item	Unit Price	Item Amount
1. _____ L.F.	Clearing and Grubbing @ _____	$ _____	$ _____
2. _____ C.Y.	Rock Excavation @ Sixty and no/100	$ 60.00	$ _____
3. _____ C.Y.	Hardpan Excavation @ Twenty-Five and no/100	$ 25.00	$ _____
4. _____ C.Y.	Hand Excavation @ _____	$ _____	$ _____
5. _____ C.Y.	Removal of Unstable Soil and Replacement with Select Fill @ Twelve and no/100	$ 12.00	$ _____
6. _____ M.B.F.	Sheeting and Shoring Ordered Left in Place @ Seven Hundred & Fifty & no/100	$ 750.00	$ _____
7. _____ L.F.	Furnish, Install, Excavate & Backfill _____- Inch Water Main @ _____	$ _____	$ _____
8.	Furnish, Install, Excavate & Backfill _____-Inch Water Main Fittings		
_____ EA.	45° Bend @ _____	$ _____	$ _____
_____ EA.	22½° Bend @ _____	$ _____	$ _____
_____ EA.	11¼° Bend @ _____	$ _____	$ _____
9. _____ EA.	_____-Inch X _____-Inch Tee @ _____	$ _____	$ _____
10. _____ EA.	Furnish, Install, Excavate & Backfill _____-Inch Gate Valves @ _____	$ _____	$ _____

Item No. and Estimated Quantity	Item	Unit Price	Item Amount
11. _____ EA.	Furnish, Install, Excavate & Backfill Fire Hydrant Assembly including Fittings, Hydrants, Gate Valve, Valve Box & Blocking @_____	$ _____	$ _____
12. _____ L.F.	Furnish, Install, Excavate & Backfill 6-Inch Water Main for Hydrant Connections @_____	$ _____	$ _____
13. _____ EA.	Furnish, Install, Excavate & Backfill_____-Inch Air Release Valve Assembly with Necessary Miscellaneous Piping, Fittings, and valve (meter) box or manhole. @_____	$ _____	$ _____
14. _____ EA.	Furnish, Install, Excavate & Backfill_____-Inch Blow-off or Flushing Hydrant, Valve Assembly including Fittings, Gate Valve Box and Pipe Cap. @_____	$ _____	$ _____
15. _____ S.Y.	Replace Plant Mix Pavement (Overlay) @_____	$ _____	$ _____
16. _____ L.F.	Place Base Asphalt in Trench @_____	$ _____	$ _____
17. _____ L.F.	Replace Surface Treated Pavement @_____	$ _____	$ _____
18. _____ L.F.	Asphalt Driveways @_____	$ _____	$ _____
19. _____ L.F.	Stone for Driveways and Roadways @_____	$ _____	$ _____
20. _____ L.F.	Concrete Driveways @_____	$ _____	$ _____
21. _____ C.Y.	Concrete - Nonreinforced @_____	$ _____	$ _____

Item No. and Estimated Quantity	Item	Unit Price	Item Amount
22. _____C.Y.	Concrete - Reinforced @ _____	$ _____	$ _____
23. _____L.F.	Seeding - Wooded Areas @_____	$ _____	$ _____
24. _____L.F.	Seeding - Lawn Kept Areas @_____	$ _____	$ _____
25. _____EA.	Straw Bales for Erosion Control, Staked. @_____	$ _____	$ _____
26. _____L.F.	Rip-Rap @_____	$ _____	$ _____
27. _____L.F.	Silt Fence @_____	$ _____	$ _____
28. _____L.F.	Tunneling and/or Boring (complete except for pipe) for___-Inch Water Main @_____	$ _____	$ _____
29. _____Lump Sum	Mobilization @_____	$(Lump Sum)	$ _____
		TOTAL (Items 1 - 29) =	$ _____

NOTE: "If the bid from the lowest responsible bidder exceeds available funds, the County may negotiate with the low bidder to obtain a contract price within available funds."

TYPICAL BID FORM

(Example Only - Engineers shall prepare a standard bid proposal for each project using this typical bid form as a guideline.)

FOR
SEWER PROJECTS

CONTRACT NUMBER _____

Item No. and Estimated Quantity	Item	Unit Price	Item Amount
1. _____ L.F.	Clearing and Grubbing @ _____	$ _____	$ _____
2. _____ C.Y.	Rock Excavation @ Sixty and no/100_____	$ 60.00	$ _____
3. _____ C.Y.	Hardpan Excavation @ Twenty-Five and no/100____	$ 25.00	$ _____
4. _____ C.Y.	Hand Excavation @ _____	$ _____	$ _____
5. _____ C.Y.	Removal of Unstable Soil and Replacement with Select Fill @ Twelve and no/100_____	$ 12.00	$ _____
6. _____ M.B.F.	Sheeting and Shoring Ordered Left in Place @ Seven Hundred & Fifty & no/100	$ 750.00	$ _____
7. _____ L.F.	Furnish, Install, Excavate & Backfill 8-Inch Sanitary Sewer 0-6 Feet @ _____	$ _____	$ _____
_____ L.F.	6-8 Feet @ _____	$ _____	$ _____
_____ L.F.	8-10 Feet @ _____	$ _____	$ _____
_____ L.F.	10-12 Feet @ _____	$ _____	$ _____
_____ L.F.	Over 12 Feet @ _____	$ _____	$ _____

Item No. and Estimated Quantity	Item	Unit Price	Item Amount
8. _____L.F.	Furnish, Install, Excavate & Backfill Line & Tee for 6-Inch House Connections with Plug @_____	$_____	$_____
9. _____V.F.	Furnish, Install, Excavate & Backfill 48-Inch Diameter Manholes (complete including casting) @_____	$_____	$_____
10. _____V.F.	Furnish, Install, Excavate & Backfill 60-Inch Diameter Manholes (complete including casting) @_____	$_____	$_____
11. _____L.F.	Replace Plant Mix Pavement (Overlay) @_____	$_____	$_____
12. _____L.F.	Place Base Asphalt in Trench @_____	$_____	$_____
13. _____L.F.	Replace Surface Treated Pavement @_____	$_____	$_____
14. _____L.F.	Stone for Driveways @_____	$_____	$_____
15. _____C.Y.	Concrete Encasement @_____	$_____	$_____
16. _____L.F.	Seeding - Wooded Areas @_____	$_____	$_____
17. _____L.F.	Seeding - Lawn Kept Areas @_____	$_____	$_____
18. _____EA.	Straw Bales for Erosion Control, Staked @_____	$_____	$_____
19. _____L.F.	Silt Fence @_____	$_____	$_____

Item No. and Estimated Quantity	Item	Unit Price	Item Amount
20. _____L.F.	Tunneling and/or Boring (complete except for pipe) for _____-Inch Sewer Main @ _____ _____	$ _____	$ _____
21. Lump Sum	Mobilization @ _____ _____	$Lump Sum__	$ _____
		Total (Items 1 - 21)= _	$ _____

NOTE: "If the bid from the lowest responsible bidder exceeds available funds, the County may negotiate with the low bidder to obtain a contract price within available funds."

discharge or remove from the project any employee the Contractor or any subcontractor who is incompetent or negligent in the performance of his duties, or who refuses or neglects to comply with the directions of the Owner, Engineer or Contractor. Any person so discharged from the project shall not be employed again without written consent of the Owner.

29. INCREASED OR DECREASED WORK

The Owner may increase or decrease the value of the Work at any time, with or without the agreement of the Contractor. The Owner may increase or decrease the Work by adding, omitting or relocating sections, whether shown on the Plans or not.

If the increase, decrease, or relocation of the Work is substantially the same in nature as the remainder of the Work, then the Contract Price shall be adjusted based on the unit prices contained in the Contract Documents. Whenever additional work involves a substantial change in the nature of the design of the Work or in the type of construction, the additional Work shall be performed in accordance with the specifications and as directed by the Engineer, provided, however, that before the Contractor begins to perform the additional Work, a Change Order shall be executed by the parties.

30. WORK IN BAD WEATHER

No Work shall be performed during stormy or inclement weather unless it can be performed in a satisfactory and workmanlike manner.

31. WORK OUTSIDE OF NORMAL WORKING HOURS

Normal working hours for the project are 8:00 A.M. to 4:30 P.M., Monday through Friday. If the Contractor desires to perform work outside of the normal working hours, it shall request the Owner's permission at least 48 hours in advance of the time when the Contractor proposes to perform the Work. The Owner may refuse the Contractor permission to work outside of normal working hours for any reason, including but not limited to the owner's difficulty in making arrangements for proper inspection of the Work. The Contractor shall avoid making undue noise when working outside of normal working hours. Under normal circumstances the Contractor will not be permitted to work on Sundays or on holidays without written approval from the Owner.

The contractor may request, in writing, different normal working hours than those stated above. The revised work hours must be agreed upon by the Inspector and approved by the Owner in writing. Work in excess of 40 hours per week shall be considered overtime work.

57. DRUG FREE WORKPLACE

During the performance of this contract, the contractor agrees to:

A. Provide a drug-free workplace for the contractor's employees

B. Post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition.

C. State in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace.

D. Include the provisions of the foregoing clauses in every subcontract or purchase order over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, "drug-free workplace" means as site for the performance of work done in connection with a specific contract awarded to a contractor in accordance with this chapter, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

58. AWARD NOTIFICATION

For information pertaining to the award of this procurement transaction, bidders may access public notification electronically at www.chesterfield.gov/ManagementServices/Purchasing/purchase.asp

59. UNBALANCED BIDS

The County reserves the right to negotiate unbalanced unit prices with the lowest bidder prior to award and to award to the next low bidder if a reasonable fee is not achieved.

60. ENVIRONMENTAL MANAGEMENT

Contractor shall be responsible for complying with all applicable federal, state, and local environmental regulations, if any. Additionally, the Contractor must meet all Chesterfield County Environmental Management System (EMS) requirements. For questions or additional information, contact the Office of Environmental Management at (804)717-6531.

61. FAITH-BASED ORGANIZATIONS

Chesterfield County does not discriminate against faith-based organizations in accordance with the Code of Virginia, Section 2.2-4343.1.

62. WATER LINE TIE-INS

All water line tie-ins to the existing distribution system including vertical and horizontal relocations shall be coordinated with the Operations and Maintenance Section of the Utilities Department. Tie-ins shall be scheduled Monday thru Thursday from 9:00 a.m. to 4:00 p.m. Tie-ins may be required outside of this time and/or during nighttime hours.

The County reserves the right to require the Contractor to perform tie-ins outside of the normal working hours detailed above in the interest of public safety or customer service. No claim for additional compensation shall be made by the Contractor when such occasions occur.

Proper preparation including field verification of the plans shall be accomplished to minimize shutdown time and prevent the tie-in from exceeding scheduled shutdown time. Sufficient personnel, equipment and materials shall be on site prior to the water being shut off. Where applicable, excavation and preassembling of fittings shall be performed. If, in the opinion of the inspector, sufficient resources are not available, the tie-in will be cancelled and rescheduled.

Tie-ins to asbestos cement pipe shall be made to rough barrel pipe. Tie-ins to the machined section of asbestos pipe will not be permitted. Where asbestos cement pipe couplings have been removed, the machined end of the pipe shall be removed. Abandonment of cement asbestos pipe shall be per state and federal requirements.

Tie-ins involving fittings shall include provisions for temporary blocking until concrete blocking has cured.

All pipe and fittings used for a tie-in are to be swabbed with a 1% chlorine solution prior to connection.

AGREEMENT

THIS AGREEMENT, made this _____, by and between **the County of Chesterfield, Virginia,** hereinafter called "OWNER" and _____doing business as_____(an Individual) or (a Partnership) or (a Corporation) hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR shall commence and complete construction of
   _____
   _____
   _____

2. The CONTRACTOR shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR shall commence the work required by the CONTRACT DOCUMENTS within Ten (10) calendar days after the date of the NOTICE TO PROCEED. Work shall be substantially complete within _____ calendar days unless the period for completion is extended otherwise by the CONTRACTOR DOCUMENTS. Work shall be finally complete and ready for final payment within _____ calendar days unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

4. The CONTRACTOR shall perform all of the WORK described in the CONTRACT DOCUMENTS and shall comply with the terms therein for the sum of $___or as shown in the BID schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

   (A) Advertisement

   (B) Instructions to BIDDERS

   (C) BID FORM

   (D) BID BOND

   (E) Agreement

   (F) General Conditions

   (G) Supplemental General Conditions

COUNTY NO. _____

The Contractor's indemnification obligation hereunder with respect to any and all claims against the County or any of its officers, agents or employees, by any employee or statutory employee of the Contractor, or of any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts the Contractor or Subcontractor may be liable, shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Worker's Compensation Acts, Disability Benefit Acts or other Employee Benefit Acts.

The Contractor's indemnification obligation hereunder shall not extend to the liability of the Engineer, his agent or employees arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Engineer, his agents or employees provided such giving or failure to give is the primary cause of the injury or damage. The Contractor's indemnification obligation contained in this paragraph are in addition to any other indemnification obligation of the Contractor set forth within the Contract Documents.

8. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

9. During the performance of this Contract, the Contractor agrees as follows:

   (A) The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

   (B) The Contractor, in all solications or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer.

   (C) Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation, shall be deemed sufficient for the purpose of meeting the requirements of this section.

   The contractor shall include the provisions of the foregoing paragraphs (A), (B) and (C) in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

COUNTY NO. _____

CONTRACTOR

BY _____
(Signature)

NAME _____
(Typed or Printed)

TITLE _____

ADDRESS _____

_____

(SEAL)

ATTEST:

_____
(Secretary)

NAME _____
(Please Type)

(Affix Corporate Seal)

CHESTERFIELD COUNTY

BY _____
(Signature)

NAME _____
(Typed or Printed)

TITLE _____

(SEAL)

ATTEST:

_____

NAME_____
(Please Type)

TITLE_____

COUNTY NO._____

NOTICE OF AWARD

TO: _____

_____

_____

_____

Re: Project Number_____

Project Name_____

Dear_____:

Chesterfield County has reviewed the bid submitted by you for the above described work in response to its Advertisement for Bids dated _____, 20_____, and Information for Bidders. On _____ 20 ____,the Board of Supervisors awarded this project to_____ _____ in the amount of _____.

You are required by the Information for Bidders to execute the Agreement and furnish the required Contractor's Performance Bond, Payment Bond and Certificates of Insurance within fifteen (15) calendar days from the date of this notice to you.

If you fail to execute said Agreement and to furnish said Insurance Certificate (s) and Bond within fifteen (15) days from the date of this Notice, we may consider all your rights arising out of our acceptance of your Bid as abandoned and as a forfeiture of your Bid Bond. We will be entitled to such other rights as may be granted by law.

By copy of this letter, we are requesting that the Engineer submit to you four (4) copies of the Contract Documents for execution. We are also requesting that the Engineer send one (1) complete set of plans and specifications to the Construction Section for their use. After execution of the Contract Documents, please return to the Purchasing Department, attention Donna Clark.

Please acknowledge and return a copy of this Notice of Award within five (5) days from the date of this letter. Also, please include a signed copy of this notice in the five (5) contract documents being forwarded to you for execution.

COUNTY NO. _____

NOTICE TO PROCEED

DATE

TO:_____
_____
_____

Re: Project Number_____
Project Name_____

Dear _____:

You are hereby notified to commence WORK in accordance with the Agreement dated_____, 20_____, within ten (10) calendar days from the date of this letter, and you are to complete the WORK within _____consecutive calendar days thereafter. The date of the completion of all work is_____.

Prior to commencing work on_____, you are required to schedule a pre-construction meeting. This meeting may be scheduled by contacting the Utilities Department Construction Section at 796-7125.

Please acknowledge and return a copy of this Notice to Proceed within five (5) days from the date of this letter.

COUNTY OF CHESTERFIELD

By_____

Title_____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO

PROCEED is hereby acknowledged by

_____

this the_____day of

_____, 20_____

By_____

Title_____

COUNTY NO._____

INSURANCE

The Contractor shall purchase and maintain in force, at his own expense, such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's execution of the work, whether such execution be by himself, his employees, agents, subcontractors, or by anyone for whose acts any of them may be liable. The insurance coverage shall be such as to fully protect the Contractor, Owner, and the Engineer and the general public from any and all claims for injury and damage resulting by any actions on the part of the Contractor, or his forces enumerated above. The Contractor shall furnish a copy of a certificate of insurance, naming Chesterfield as an additional insured. Should any of the policies be canceled before the expiration date, the issuing company will mail 30 days written notice to the certificate holder. The Contractor shall furnish insurance in satisfactory limits, and on forms and of companies which are acceptable to the Owner's Attorney and/or Risk Management and shall require and show evidence of insurance coverages on behalf of any subcontractors before entering into any agreement to sublet any part of the work to be done under this Contract.

The following insurance requirements are the minimum that will be acceptable:

1. Worker's Compensation Insurance with statutory limits and Employers' Liability Insurance of $500,000 for one accident or aggregate disease.

2. Commercial General Liability - Including products and completed operations coverage; $1,000,000 each occurrence; no exclusion for X, C, or U hazards allowed.

3. Comprehensive Automobile Liability

(a)	Bodily Injury	$1,000,000	Each Person
		$1,000,000	Each Occurrence
(b)	Property Damage	$1,000,000	Each Occurrence

4. Umbrella Liability Insurance $2,000,000 Each Occurrence

5. The Contractor shall name as additional insureds on the CGL policy those property owners requesting this, if the work will take place on their property. The Contractor shall provide Certificates of Insurance evidencing this to the property owners and Owner's Risk Manager.

The Contractor shall be responsible for maintaining current certificates of insurance on file with the Owner, and the Insurance Company shall be responsible for notifying the Owner thirty (30) days prior to the expiration, cancellation, non-renewal, or material change in the coverage.

The Contractor shall be responsible for continuing in force completed operations, bodily injury and property damage coverage for a minimum of two (2) years after completion and acceptance of the work.

INSTRUCTIONS REGARDING INSURANCE CERTIFICATES

The Contractor and his insurance company should carefully review the insurance requirements applicable to this job. All requirements must be met before the County will execute the contract. In particular, we would call your attention to the following:

1. Please note that the Insurance Certificate must state that the Commercial General Liability and the Umbrella Liability Insurance Policies name Chesterfield County as additional insured. This requirement may be met by placing the following language on the Certificate. Many Certificates have a space headed **"OTHER"** where the language may be inserted as follows:

   All general liability and excess liability policies coverages listed hereon name Chesterfield County as additional insured.

2. The Insurance Certificate must also contain the required statement concerning notice of cancellation or other change in coverage. The statement used on some Certificate forms is not acceptable. The statement which is required by the contract documents reads as follows:

   "Such certificate shall provide that in the event of the cancellation of the policy or policies listed on such certificate, not less than 30 days notice in writing shall be given to the County. **NOTE:** The cancellation clause in the Insurance Certificate should be modified by striking the words 'endeavor to' in the second line and by striking the clause reading 'but failure to mail such notice shall impose no obligation or liability of any kind upon the company'."

3. The Certificate Holder should be listed as:

   County of Chesterfield, VA
   c/o Purchasing Department
   P. O. Box 51
   Chesterfield, VA 23832-0051

4. Bid, job, or subject name must appear on Certificate for identification purposes.

5. Certificate of Insurance must have a signature.

Compliance with all five of the above requirements is demonstrated on the attached blank certificate form.

S A M P L E

CERTIFICATE OF INSURANCE	ISSUE DATE (MM/DD/YY)
PRODUCER	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. COMPANIES AFFORDING COVERAGE
INSURED COVERAGES	COMPANY LETTER A COMPANY LETTER B COMPANY LETTER C COMPANY LETTER D COMPANY LETTER E

This is to certify that polices of insurance listed below have been issued to the insured named above for the policy period indicated. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions, and conditions of such policies.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY DATE	POLICY EFF. DATE	LIABILITY LIMITS IN THOUSANDS		
	GENERAL LIABILITY ____Comprehensive Form ____Premises/Operations Underground Explosion ____& Collapse Hazard Products/Completed ____Operations ____Contractual ____Independent Contr. Broad Form ____Property Damage ____Personal Injury					EACH OCCURRENCE	AGGREGATE
					BODILY INJURY	$	$
					PROPERTY DAMAGE	$	$
					BI & PD COMBINED	$	$
					Personal Injury		$
	AUTOMOBILE LIABILITY ____Any Auto All Owned Autos ____(Priv. Pass.) ____Hired Autos ____Non-Owned Autos ____Garage Liability ____ _____				Bodily Injury $ (per person)		$
					Bodily Injury $ (per accident)		$
					Property Damage $		$
					BI & BD Combined $		$
	EXCESS LIABILITY ____Umbrella Form Other Than Umbrella Form				BI & BD Combined $		$
	Workers= Compensation and Employers= Liability				**Statutory** $ (Each Accident) $ (Disease-Policy Limit) $ (Disease-Each Employee)		
	OTHER All general liability and excess liability policies coverages listed hereon name the County of Chesterfield, Virginia, as an additional insured.						

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

CERTIFICATE HOLDER	CANCELLATION
County of Chesterfield, Virginia c/o Purchasing Department P.O. Box 51 Chesterfield, Virginia 23832-0051	The Insurance Company issuing each of the policies listed hereon shall mail the certificate holder notice of any expiration, cancellation, non-renewal, or material change in coverage 30 days prior to the effective date of any such expiration, cancellation, non-renewal, or material change in coverage.

e. The pipe shall be fitted and matched so that when laid in the work, units will form a smooth, uniform invert.

f. Prior to joining the pipe, all surfaces of the pipe to be joined and the surfaces of factory made jointing materials shall be clean and dry. Approved lubricants, primers, adhesives, etc., shall be applied and the pipes joined as recommended by the manufacturer's specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is "home". The interior of the pipe shall be cleaned of all foreign material as the work progresses. At the end of the work day, the last pipe laid shall be blocked to prevent creep, and closed with a water tight plug or cap.

g. Joining Pipe:

1) Ductile iron pipe to be joined as follows:

a) Mechanical joint pipe

(1) When installing PVC pipe into M.J. fittings, the beveled end of the pipe must be cut off to allow for maximum insertion depth and sealing area to avoid leaks. An approved joint restraint device is required when inserting PVC into MJ fittings. This device does not replace the requirements for a joint restraint system. Thoroughly clean inside of the bell and 8 inches of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating and other foreign matter from the joint. Lubricate the bell and spigot end of the pipe, using only approved lubricant (Blue Lube or Slikstyx). (Note: Use of any unapproved lubricant other than Blue Lube or Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions as a result of the use of unapproved lubricants.) Slip cast-iron gland on spigot end with lip extension of gland toward end of pipe. Lubricate rubber gasket

with approved lubricant referenced above and place on the spigot end with thick edge toward the gland.

(2) Push the spigot end forward to seat in the bell. Then carefully press the gasket into the bell so that is located evenly around the joint. The gland is moved into position, bolts inserted and nuts screwed on finger tight, then tighten all nuts to torque listed below.

Bolts Size Inches	Torque-Ft.Lbs.		
5/8	40	-	60
3/4	60	-	90
1	70	-	100
1 1/4	90	-	120

(3) Tighten nuts on alternate sides of the gland until pressure on the gland is equally distributed and torque value is reached.

(4) Permissible deflection in mechanical joint pipe shall not be greater than one-half the maximum amount allowed in AWWA C600.

b) Push-on joint Ductile Iron pipe

(1) Thoroughly clean inside of the bell and 8 inches of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating, and other foreign matter. Flex rubber gasket and insert in the gasket recess of the bell socket. Apply a thin film of approved gasket lubricant (Blue Lube or Slikstyx), to the gasket and the spigot end of the joining pipe. (Note: Use of any unapproved lubricant other than Blue Lube or Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions as a result of the use of unapproved lubricants.)

(2) Start spigot end of pipe into socket with care. The joint shall

then be completed by forcing the plain end to the bottom of the socket with a forked tool or jack type device. Field cut pipe shall have the end filed to match the manufactured spigot end.

(3) Permissible deflection in push-on joint pipe shall not be greater than 1/2 of that listed in AWWA C600.

2) Polyvinyl chloride (PVC) pipe shall be joined in accordance with the manufacturer's recommendations.

Polyvinyl Chloride (PVC) Push-on Joint Pipe

a) Thoroughly clean inside of the bell and 1" beyond the reference mark on the spigot end of the joining pipe. Make certain the ell and rubber gasket have no foreign material that could interfere with the proper assembly of the pipe spigot.

b) Lubricate the gasket and spigot end of the pipe, using only approved lubricant (Blue Lube or Slikstyx). (Note: Use of any unapproved lubricant other than Blue Lube or Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions as a result of the use of unapproved lubricants.)

c) Insert the spigot end into the bell. Align the pipe sections and push the spigot end in until the reference mark on the spigot end is flush with the end of the bell. Use a bar and block of wood to push pipe home.

d) Field cut pipe shall be square cut and beveled to insure proper assembly. Use a factory finished beveled end as a guide to produce an equivalent angle and length of taper.

3) Asbestos Cement Transition:

a) When connecting PVC or Ductile Iron pipe to existing asbestos cement pipe, the transition coupling is to be applied to the rough barrel of the

asbestos cement pipe and not to a factory or machined end of the asbestos cement pipe.

h. A tracing wire of 14 gauge copper shall be installed and taped directly on top of the pipe in a manner that a continuous tract results. Wire is to be wrapped around hydrants, blow offs and corporation stops.

i. Place underground warning tape directly above all water mains, 18" below finished grade. Tape shall be polyethylene tape with a metallic core, 2 inches in width, with the continuous printed message "Caution Waterline Buried Below." Tape shall be Catalog No. 2 WAT as manufactured by the Seton Name Plate Corp. or approved equal.

j. In addition to letter h and i of this section above, all lengths of pipe within a joint restraint system shall have a marker tape (BLUE with text: “Water Restrained Joints”) attached directly to the top of the pipe with duct tape.

C. Installation of Valves, Fittings, and Hydrants:

1. General: Valves, fittings and hydrants shall be set and jointed to the piping system as hereinbefore specified for cleaning, laying and jointing pipe.

2. Valves and Valve Boxes: Cast iron valve boxes shall be firmly supported, centered and plumb over the operating unit of valve. Box cover shall be set flush with the surface of finished pavement or at such other level as may be directed by the Owner. Valve rod extension with guide shall be required to maintain a distance of 2'-4' from operating nut to top of box. All valves shall be properly restrained.

3. Valve Key Extensions: Valve stem extensions shall be required where the valve-operating nut is installed at a depth greater than four feet (4’).

4. Cross Connections: Drainage branches or blowoffs shall not be connected to any sewer, submerged in any stream or installed in any manner which, in the opinion of the Owner, will constitute a contamination hazard, or cross connection.

5. Hydrants: Connection to Main: Each hydrant shall be restrained and connected to the main with a minimum 6 inch branch, controlled by an independent 6 inch gate or resilient seat valve. Setting of Hydrants: When hydrants are set, a drainage pit two feet in diameter and two feet below the bowl of the hydrant shall be excavated. Valves: All valves shall be restrained with a hydrant tee.

d. Tap shall be made with a tapping machine equipped with a bit designed for the type of pipe being tapped

e. Distance between taps or from a joint or bell shall be a minimum of 18"

f. Service pipe shall be type "K" hard copper

g. Services shall be installed with 3'6" minimum cover up to meter yoke where yoke shall be installed so that meter will set 12" -16" from finished grade

h. Meter yokes shall be from approved materials list and be installed with a tail piece of type "K" copper 10" - 18" long

i. Meter yoke and box shall be set 1' inside property line or a reasonable distance inside property line in order to install on reasonably level ground

j. On 1½" and 2" services a curb stop shall be installed on inlet side of yoke, 1' from yoke

k. Backfill shall be hand tamped up to service pipe at tap to prevent corporation stop from being broken off during backfilling

F. Installation of Water Mains and Water Meter Boxes as it relates to Sidewalks:

1. Sidewalks must be constructed to accommodate at least a 4 foot horizontal separation between the County’s public water mains.

2. If sidewalks are constructed within the public road right-of-way, the street side of all water meter boxes must be installed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater.

3. If sidewalks are constructed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the street side of all water meter boxes must be installed 3 feet behind the house side of the sidewalk.

4. If the sidewalks are constructed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the water services must be installed within 1 foot outside of the right-of-way line.

3.02 TESTING OF WATER DISTRIBUTION SYSTEM

A. Testing Techniques for Water Distribution System:

1. Each properly isolated section of the piping system including all water services shall be subjected to a pressure test of 150 psi or 1½ times the working pressure, whichever is greater, measured at the high point of the system. Maintain this pressure for a minimum of two hours with an allowable leakage as reflected in the Standard Details Section, Part II. Prior to applying pressure to the lines all reaction blocking, and/or mechanical restraint shall have been completed to the satisfaction of the Engineer or Inspector. As the pipes are being filled, all air shall be expelled from the pipes by providing suitable taps at the high points of the system. After the system is filled, all taps shall be tightly plugged. Any defects discovered during this test shall be corrected as directed and the test shall be repeated until the results are satisfactory. The Contractor shall provide all equipment and materials and perform all labor necessary to conduct the test in the prescribed manner. The Contractor shall provide a suitable test pump and properly calibrated gauge or other means for measuring leakage to include, a clean 50 gallon barrel with top cut out which is satisfactory to the Engineer or Inspector.

2. The Owner will furnish water for flushing, sterilization and testing without charge. Filling of water line may be performed provided permission has been obtained from the Inspector who will be responsible for coordinating this activity with the County's Operations and Maintenance Section. Contractor is not permitted to operate valves on existing lines.

3. Testing shall be performed in accordance with the AWWA Specifications, latest edition.

3.03 DISINFECTION

A. Prior to being placed in service, the pipe line and appurtenances shall be disinfected in general accordance with ANSI/AWWA C651- 92; AWWA Standard for **Disinfecting Water Mains** and the supplemental procedures as set forth below.

1. Section 3 of AWWA C651-92 emphasizes six basic procedures in the disinfection process. The procedures are to:

a. prevent contaminating materials from entering the water main during storage, construction, or repair;

b. remove, by flushing or other means, those materials that may have entered the water main;

c. chlorinate any residual contamination that may remain, and flush the chlorinated water from the main;

d. protect the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures;

e. determine the bacteriological quality by laboratory test after disinfection; and

f. make final connection of the approved new water main to the active distribution system.

2. Preliminary Flushing:

The main shall be flushed prior to disinfection at a velocity of not less than 2.5 Ft./Sec. unless the owner determines that conditions will not permit the required flow. See Table 1, entitled "Flushing Schedule". Adequate provisions shall be made by the contractor for disposal of flushing water so that no physical or environmental damage results. Contractor will find additional instructions on flushing in the supplemental procedures within this section.

3. Forms of Chlorine for Disinfection:

It is the contractor's responsibility to be familiar with and have available for his employees the "Product Data Safety Sheets" of any products used as a source of chlorine and to provide the proper safety instructions and personal protective equipment to the employees mixing and using materials for disinfection of the water facilities.

a. Acceptable sources of chlorine for disinfection may be obtained from any of the following three sources:

1) Liquid sodium hypochlorite (household bleach)

2) Liquid sodium hypochlorite (industrial strength)

3) Calcium hypochlorite granules

b. Only under extreme conditions and with the written approval of the Owner and under the direction of a holder of a State of Virginia Class III (or higher) water works operator's license can chlorine gas, regulated through proper metering equipment, be mixed with water to obtain a suitable disinfecting solution.

c. The direct introduction of chlorine gas (or liquid) from a pressure cylinder into a water line is not safe and shall not be allowed.

d. The use of calcium hypochlorite pills affixed to the interior of water pipe for disinfection shall not be an acceptable form of disinfection.

e. The mixing of a source of chlorine to obtain a suitable disinfecting solution shall be as follows:

1) Liquid sodium hypochlorite is supplied in strengths from 5.25 percent available chlorine (commercially available household bleach) to 15 percent available chlorine (industrial strength sodium hypochlorite). A water-sodium hypochlorite solution shall be prepared by adding liquid sodium hypochlorite to water.

2) A water calcium hypochlorite solution shall be prepared by dissolving calcium hypochlorite granules containing 65% available chlorine by weight in a pre-determined volume of water to make the desired water-calcium hypochlorite concentration. Disinfection of new mains by water calcium hypochlorite solution shall not be used unless a suction or in-line strainer is available on the solution pump to prevent any undissolved solids from entering the piping. An alternative method of straining the solution to remove undissolved granules may be approved by the inspector on a case by case basis.

3) A water-chlorine gas solution may be used only when suitable equipment is available and shall be done under the direct supervision of a person familiar with the physiological, chemical, and physical properties of this element and who has a State of Virginia Class III or above water works operator's license and is properly trained and equipped to handle any emergency that may arise.

4) The direct introduction of chlorine gas (or liquid) from a pressure cylinder into a water line is not safe and shall not be allowed.

4. Method of Chlorine Application and Testing:

a. The continuous feed method of applying the disinfecting solution shall be as follows: Water from the existing distribution system or other approved sources of potable water supply shall flow through an approved flushing mechanism (Standard Detail WAT-6) at a constant, measured rate into the newly-laid pipeline. The water shall be mixed with a chlorine-water solution as prepared above, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration of the water and water/chlorine solution in the pipe is elevated to and maintained at, a minimum of 50 mg/1 available chlorine.

Since the forms of preparation for a water sodium hypochlorite or water calcium hypochlorite concentration are a batch process, a method acceptable to the inspector shall be available to replenish the concentration being fed and mixed with the water flow, so there is no interruption of the flow of disinfection solution.

To assure that this concentration is maintained, the chlorine residual shall be measured at intervals not exceeding 2,000 feet and at the end of all branch lines or cul-de-sacs in accordance with the procedures outlined herein. During the application of the chlorine-water solution, valves, hydrants and any other appurtenances shall be operated in order to be thoroughly disinfected. Chlorine-water solution application shall continue until the entire new main is filled with water having a residual of a minimum of 50 mg/1 chlorine solution. The chlorinated water shall be retained in the main for at least 24 hours.

b. The Owner will furnish the personnel and equipment for determining water-chlorine solution strengths and residuals.

c. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine residual of the water leaving the main is equal to the chlorine residual of the incoming system water. At that time, the new system shall be valued off and bacteriological testing shall begin as indicated

in Section 3.03.B. Additional instructions for disposal of the heavily chlorinated water is covered in Section 3.04.E, entitled "Flushing".

B. Bacteriological Tests:

1. After final flushing, and before the water main is placed in service, samples shall be collected and tested for bacteriological quality as follows:

a. If total chlorine is 1.5 mg/L or less: Begin bacteriological testing at 24 hours after final flush.

1) Test for total and fecal coliform for 2 consecutive days. Both test samples must be less than 1 colony/100 ml.

2) Test for heterotrophic plate count on 2nd day. Test sample must be less than 500 colonies/ml.

b. If total chlorine is greater than 1.5 mg/l: Wait 5 days or until residual drops to 1.5 mg/1 or less, whichever is sooner, then test.

1) Test for total and fecal coliform for 2 consecutive days. Both test samples must be less than 1 colony/100 ml.

2) Test for heterotrophic plate count on 2nd day. Test sample must be less than 500 colonies/ml.

Samples shall be collected at least 24 hours apart at intervals determined by the Inspector (not exceeding 2,000 feet apart and at the end of all branch lines and cul-de-sacs) and tested by the County of Chesterfield laboratory and the results submitted to the Owner.

2. Samples for bacteriological analysis shall be collected in approved sterile bottles or bags treated with sodium thiosulfate provided by the County laboratory. If laboratory results indicate the presence of coliform bacteria, the samples are unsatisfactory and disinfection shall be repeated as prescribed above until the samples are satisfactory. Cleaning, disinfection and testing shall be under the direction of the Inspector but remains the responsibility of the Contractor. Water for these operations will be furnished by the Owner, but the Contractor shall be responsible for any cost associated with the loading, hauling, and discharging of the heavily chlorinated water.

3.04 SUPPLEMENTAL PROCEDURES FOR DISINFECTING, TESTING, AND FLUSHING

A. GENERAL:

1. All work shall be performed in general accordance with AWWA C651-92.

2. The supplemental procedures are developed to compliment the AWWA C651-92 Standard, particularly with respect to flushing, testing and tie-in to the existing water distribution system.

3. These procedures and construction acceptance for final tie-in of a new water main are performance based, predicated on the new construction passing pressure and bacteriological testing. In order to best assure satisfactory bacteriological results, it is essential that all aforementioned preventive and precautionary measures be taken prior to and during construction to protect the interiors of pipe, fittings and valves against contamination. Failure to follow the precautionary measures increases the likelihood of unsatisfactory bacteriological tests and increases the construction requirements necessary for final acceptance. Refer to AWWA C651-92, Section 4, entitled "Preventive and Corrective Measures During Construction".

4. No contaminated material or any material capable of supporting the growth of microorganisms or causing taste, odor, or other aesthetic water quality concerns shall be used in sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation or sealing gaskets shall be Blue Lube or Slikstyx pipe gasket lubricant. Blue Lube and Slikstyx are the only pipe joint lubricant for such use. It shall be kept clean and applied clean with dedicated applicators. (Note: Use of any unapproved lubricant other than Blue Lube or Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions as a result of the use of unapproved lubricants.)

5. Table 1, Flushing Schedule gives flushing flow rates and flushing mechanism sizes for water mains 6" through 24" in diameter. Specific flushing schedules for line sizes above 24" will be project and site specific and directions will be given on the project drawings.

B. Filling and Testing Procedures:

1. Connection of the new water main to the existing distribution system for filling and testing shall be through a contractor furnished flushing mechanism as shown on Standard Detail WAT-6 of these specifications and sized as noted in Table 1, entitled "Flushing Schedule". The contractor is to furnish the single gate valve, double check valve flushing assembly and all necessary fittings, reducers, increases and sleeves to make the piping connections. A suitable valued piping arrangement for the additions of the water-chlorine solution is to be available on the new line side of the flushing assembly. The assembly is to be furnished with 125 psi rated flange connections and installed in a manner approved by the Inspector.

2. Initial flush time is to be in accordance with Table 1, entitled "Flushing Schedule".

3. Pressure test the line as noted in Section 3.02, A.l of these specifications.

4. Make any necessary repairs and pressure test again until the line passes this test.

5. Disinfect the line in accordance with AWWA C651-92, Section 5. A water-chlorine solution prepared in accordance with Section 3.03 A.3 above shall be used for disinfection.

6. Bacteriological samples will be taken by the County in accordance with AWWA C651-92, Section 7.

7. If unsatisfactory bacteriological test results are received, repeat steps 2, 5 and 6. Where only an unsatisfactory heterotrophic plate count is received, steps 2 and 6 need only be repeated at existing residuals.

8. After receiving satisfactory bacteriological test results, the contractor shall coordinate with the Inspector the connecting of the new main to the existing system. All connecting pipe and fittings shall be clean and free of debris and shall be swabbed or sprayed with a 1 percent sodium hypochlorite solution before they are installed. The contractor shall tie-in new water lines to the existing water system within 10 working days of successful completion of all bacteriological tests, otherwise the disinfection process must be repeated.

9. Final flush of line to be in accordance with Table 1, entitled "Flushing Schedule".

C. The Disinfection and Supplemental Procedures as covered in sections 3.03 and 3.04 may be modified by the Director of Utilities for site specific problems that do not physically allow for following the normal disinfection procedures. Modified instructions will be given in writing from the Director through the Inspector and will be executed by the Contractor in a manner that does not subject the existing distribution system to undue problems and assures that adequate disinfection and flushing will be given to the new main.

D. The procedure for the disinfection of short leads to fire hydrants and the connector pipe to fire suppression systems/ double check assemblies shall be as follows:

Connector piping, fittings and valves from an existing main to a fire hydrant or to a fire system double check assembly, which does not contain domestic use branches and is equal to or less than eighteen (18) feet in length from the main, may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just prior to installation, tied-in and flushed at a velocity of not less than 2.5 ft/sec. Bacteriological sampling will be taken downstream for confirmation.

E. Flushing:

Water for filling the line and flushing will be supplied by the Owner at no cost to the Contractor. Therefore, the use of water for making the new water line available for service will be as follows:

1. Initial Flush:

See Table 1, entitled "Flushing Schedule". This is to be a high velocity flush through all sections of the new line. Since the large volume of water may have effects on the existing distribution system, the initial flushing is to be done only with the approval of and under the direction of the Inspector. System demands may cause this flushing to be done at times when the existing distribution system demands are low.

Because of the large volume of water to be flushed from the fire hydrants or flushing hydrants, the Contractor must inspect the areas of discharge and provide the necessary equipment or materials to prevent any environmental damage or erosion. Sufficient hose length and termination fittings are to be provided so as to discharge the water into stable, heavily vegetated areas, drainage ponds, storm sewers, paved ditches, etc. The contractor is to be responsible for any damage that may result from flushing.

2. Flush to remove disinfecting solution:

This is a low velocity, low flow, flush through fire or flushing hydrants to remove the disinfecting solution from the new line. In new subdivisions, or in areas where there is an existing sanitary sewer, this discharge may be made into the sanitary sewer system. The Contractor is to provide sufficient hoses to connect from the hydrants to a manhole in a manner that provides a suitable air gap for backflow prevention. In projects where there are no sanitary sewers, the flushing of the disinfecting solution must not enter any streams or be discharged in a manner that causes any environmental damage. For site specific locations the Inspector may require the use of a neutralizing chemical and piping arrangement. (See drawing WAT-10, in Part II - "Standard Details" of these specifications). The expense of a neutralizing station is the responsibility of the Developer/Contractor. The Engineer shall indicate the need for a neutralizing station on the drawing.

3. Final Flush:

See Table 1, entitled "Flushing Schedule". The final flush is a medium velocity, medium flow flush to clear the line of any chlorine solution used in the tie-in and to provide for fresh water throughout the new lines.

TABLE 1

FLUSHING TABLE			
(Nominal) Main Size	Double Check Valve Single Gate Size (Note 1)	INITIAL FLUSH (Note 2)	FINAL FLUSH (Note 2)
		Min. Flow (gpm)	Max. Flow (gpm)
6″	4″	220	88
8″	4″	400	160
12″	6″	900	350
16″	6″	1500	624
20″	8″	2450	978
24″	12″	3525	1410
30″	Designed by Consultant	5505	2202
36″	Designed by Consultant	7935	3174

NOTE: 1) See description of "Preassembled Flushing Mechanism" Section II of the specifications, Detail WAT-6.

2) Approximation of flushing flows can be made by using either a pitot tube or a method of measuring the static discharge pressure from a hydrant used for discharge of the flushing water. See Section II of these specifications, WAT-9 "Discharge Table for Hydrants"..

3) On a case by case basis, dependent upon such variables as length of new waterline (<200'); space limitations; or other unforeseeable obstacles, the inspector may authorize the use of a smaller flushing device if the use of this device will provide for adequate flushing of the new waterline.

3.05 ABANDONMENT OF WATER SERVICE

Excavate at the main and expose the corporation stop. Turn off the corporation stop and disconnect the copper tubing from the corporation stop. Assist the Inspector in referencing the location of the corporation stop for County records. Remove the meter box, yoke and service line. The Inspector will turn in the meter to the County's Utilities Operations and Maintenance Section. When existing water services are to be abandoned as a part of a utility project, the Utility Contractor shall review the scope of the work with the Utilities Inspector and then proceed to abandon those services prior to any other work commencing.

3.06 ABANDONMENT OF WATER MAINS

Water mains and hydrant laterals to be abandoned shall be permanently disconnected from the remaining system. If the abandonment takes place at a tee, the tee shall be removed from the main and straight pipe installed. For other instances involving fittings, the proper fitting shall be installed to eliminate the previous connection.

All open ends on abandoned pipe to be permanently sealed by plugging with masonry and/or mortar or plug. All valve boxes, fire hydrants, flushing hydrants blow-offs or other appurtenances to be removed. Salvageable fire hydrants are to be returned to the County's Utilities Operations & Maintenance Section.

3.07 CLEAN-UP

Upon the completion of the installation of the water system and prior to the Owner's final acceptance, sediment and debris shall be removed from the system. The work area shall be restored to its original condition and pavement replaced to the satisfaction of VDOT and/or County.

End of Section

The connector shall be of a size specifically designed for the pipe material and size being utilized on the project. All materials must conform to the approved products reflected in Part V of this document.

Where bricked up openings (B.U.O.) exist, a PVC manhole adaptor shall be used in the connection of the sewer pipe to precast manholes and installed using the proper conventional methods such as the process established for the "GPK PVC Manhole Adaptors" or equal.

F. A tracing wire of 14 gauge copper shall be installed and taped directly on top of the pipe in a manner that a continuous trace results.

G. Place underground warning tape directly above all sewer force mains, 18” below finished grade. Tape shall be polyethylene tape with a metallic core, 2 inches in width, with the continuous printed message “Caution Sewer Force Main Buried Below.” Tape shall be as manufactured by the Seton Name Plate Corp. or approved equal.

H. Installation of Sewer Lines and Laterals as it relates to Sidewalks:

1. Sidewalks must be constructed to accommodate at least a 10 foot horizontal separation between the County’s public sewer mains.

2. If sidewalks are constructed within the public road right-of-way, the end of the sewer lateral must be installed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater.

3. If sidewalks are constructed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the end of the sewer lateral must be installed 3 feet behind the house side of the sidewalk.

4. If the sidewalks are constructed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the sewer services must be installed within 1 foot outside of the right-of-way line.

3.02 TESTING OF NEW GRAVITY SANITARY SEWER AND FORCE MAIN SYSTEMS

A. Testing Technique for Gravity Sanitary Sewer System:

1. Sanitary sewer lines 42 inches in diameter and smaller shall be tested after backfill using a low-pressure air test in accordance with ASTM C828-90 or latest edition. Sewer lines larger than 42 inches in diameter

shall be tested by infiltration/exfiltration test. All manholes shall be vacuum tested. All testing shall be conducted in the presence of the Owner or Owner's representative. All labor, materials, tools, and equipment necessary to make the tests shall be provided by the Contractor. All equipment and methods used shall be acceptable to the Owner. All monitoring gauges shall be subject to calibration, if deemed necessary.

2. Low Pressure Air Test:

a. Summary of Method: Plug the section of the sewer line to be tested. Introduce low-pressure air into the plugged line. Use the quantity and rate of air loss to determine the acceptability of the section being tested.

b. Preparation of the Sewer Line: If required by Owner, flush and clean the sewer line prior to testing and cleaning out any debris. Plug all pipe outlets using approved pneumatic plugs with a sealing length equal to or greater than the diameter of the line being tested. Give special attention to laterals.

c. Ground Water Determination: Install a ½ inch capped galvanized pipe nipple, approximately 12 inches long, through the manhole on top of the lowest sewer line in the manhole. Immediately prior to the line acceptance test, the ground water elevation shall be determined by removing the pipe cap and blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic hose to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in the plastic hose.

d. Procedures: Determine the test duration for the section under test by computation from the applicable formulas shown in ASTM C828-90 or latest edition. The pressure-holding time is based on an average holding pressure of 3 psi gage or a drop from 3.5 psi to 2.5 psi gage.

Add air until the internal air pressure of the sewer line is raised to approximately 4.0 psi gage. After an internal pressure of approximately 4.0 prig is obtained, allow time for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi gage, commence the test. Before starting the test, the pressure may be allowed to drop to 3.5 psi gage. Record the drop in pressure for the test period. If the pressure has dropped more than 1.0 psi gage during the test period, the line shall be presumed to have failed. The test may be discontinued when the prescribed test time has been completed even though the 1.0 psi gage drop has not occurred.

The test procedure may be used as a presumptive test which enables the installer to determine the acceptability of the line prior to backfill and subsequent construction activities.

If the pipe to be tested is submerged in ground water, the test pressure shall be increased by 1.0 psi for every 2.31 feet the ground water level is above the invert of the sewer.

e. Safety: The air test may be dangerous if, because of lack of understanding or carelessness, a line is improperly prepared.

It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. Inasmuch as a force of 250 lb. is exerted on an 8 inch plug by an internal pipe pressure of 5 psi, it should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous.

As a safety precaution, pressurized equipment shall include a regulator or relief valve set at no more than 10 psi to avoid over-pressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

3. All manholes will be tested using the negative air pressure test (vacuum) in accordance with ASTM C 1244-93 or latest edition, for watertightness, and manhole will be visually inspected after backfilling. Contractor may backfill before testing with the understanding that any repairs will be made from the exterior of the manhole.

Manholes shall be vacuum tested and shall have 10-inches of mercury applied to the manhole and the time measured for the vacuum to drop from 10-inches to 9-inches of mercury. Vacuum equipment shall be approved by the County and/or Engineer prior to its use. See detail # SEW-10 for minimum allowable test times for manhole acceptance at the specified vacuum drop.

Test times for structures other than manholes will be based on the times for manholes of the nearest equivalent volume or as directed by the Engineer.

Written verification must be furnished that the following steps are followed:

a. The test method is only to be applied to precast concrete manholes.

b. Stubouts, manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn.

c. If a manhole fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test.

4. Test for leakage of gravity sewers using either the infiltration or exfiltration test:

a. Allowable leakage shall be 50 gallons per inch of pipe diameter per mile per 24 hours up to a maximum of 2,400 gallons per mile per 24 hours for gravity sewers greater than 42" in diameter.

b. Use infiltration test when ground water is at least 4 feet above pipe crown along entire length of line to be tested. Plug the pipe at the upper manhole. Install suitable measuring device at the next lowest manhole. Measure the amount of water flowing through the outlet after flow has been stabilized.

c. Ground Water Determination: Use same procedure as "low pressure air test" above.

B. Testing Requirements for Sewer Force Mains:

1. All pressure testing shall conform to the requirements as established for Water Distribution Systems as outlined in Part III Section 3 of this document.

3.03 MARKERS

In easements and in undeveloped wooded areas, plastic markers shall be installed every 200 feet, and at all manholes, valves, and fittings. Markers shall be as manufactured by Carsonite, Greenline, or approved equal. Exceptions are where sanitary gravity and force main lines are installed in "kept" yards where the property owners may object to the placement of these markers. Contractors will be required to properly install the markers per manufacturer's recommendations, parallel to the sewer line facing roadway, or as additionally directed by the County.

3.04 CLEAN-UP

Upon the completion of the installation of the sanitary sewer system and prior to the Owner's final acceptance, sediment and debris shall be removed from the system. The work area shall be restored to its original condition and pavement replaced to the satisfaction of VDOT and/or County.

End of Section

ADDENDUM

JANUARY 1, 2006

CHANGES TO PART IV

PART IV

DEVELOPER
WATER AND SEWER PROJECT
CONSTRUCTION SPECIFICATIONS
CHESTERFIELD COUNTY, VIRGINIA

***INSTRUCTIONS* for viewing and/or printing this document:**
PART IV is divided into three (3) sections – GENERAL CONDITIONS, TECHNICAL SPECIFICATIONS and APPENDICES. Each section has been set up with bookmarks making it more convenient to locate various topics within the document. After pulling up the section you wish to view or print, click on "BOOKMARKS" in the left hand margin of the document. (When printing the document, please remember to print this table of contents and include it in your book.)

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5. Sidewalks must be constructed to accommodate at least a 10 foot horizontal separation between the County's public sewer mains.

6. If sidewalks are constructed within the public road right-of-way, the end of the sewer lateral must be installed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater.

7. If sidewalks are constructed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the end of the sewer lateral must be installed 3 feet behind the house side of the sidewalk.

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A. Testing Technique for Gravity Sanitary Sewer System:

1. Sanitary sewer lines 42 inches in diameter and smaller shall be tested after backfill using a low-pressure air test in accordance with ASTM C828-90 or latest edition. Sewer lines larger than 42 inches in diameter shall be tested by infiltration/exfiltration test.

   All manholes shall be vacuum tested. All testing shall be conducted in the presence of the Owner or Owner's representative. All labor, materials, tools, and equipment necessary to make the tests shall be provided by the Contractor. All equipment and methods used shall be acceptable to the Owner. All monitoring gauges shall be subject to calibration, if deemed necessary.

2. Low Pressure Air Test:

   a. Summary of Method: Plug the section of the sewer line to be tested. Introduce low-pressure air into the plugged line. Use the quantity and rate of air loss to determine the acceptability of the section being tested.

b. Preparation of the Sewer Line: If required by Owner, flush and clean the sewer line prior to testing and cleaning out any debris. Plug all pipe outlets using approved pneumatic plugs with a sealing length equal to or greater than the diameter of the line being tested. Give special attention to laterals.

c. Ground Water Determination: Install a ½ inch capped galvanized pipe nipple, approximately 12 inches long, through the manhole on top of the lowest sewer line in the manhole. Immediately prior to the line acceptance test, the ground water elevation shall be determined by removing the pipe cap and blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic hose to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in the plastic hose.

d. Procedures: Determine the test duration for the section under test by computation from the applicable formulas shown in ASTM C828-90 or latest edition. The pressure-holding time is based on an average holding pressure of 3 psi gage or a drop from 3.5 psi to 2.5 psi gage.

Add air until the internal air pressure of the sewer line is raised to approximately 4.0 psi gage. After an internal pressure of approximately 4.0 prig is obtained, allow time for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi gage, commence the test. Before starting the test, the pressure may be allowed to drop to 3.5 prig. Record the drop in pressure for the test period. If the pressure has dropped more than 1.0 psi gage during the test period, the line shall be presumed to have failed. The test may be discontinued when the prescribed test time has been completed even though the 1.0 psig drop has not occurred.

The test procedure may be used as a presumptive test which enables the installer to determine the acceptability of the line prior to backfill and subsequent construction activities.

If the pipe to be tested is submerged in ground water, the test pressure shall be increased by 1.0 psi for every 2.31 feet the ground water level is above the invert of the sewer.

e. Safety: The air test may be dangerous if, because of lack of understanding or carelessness, a line is improperly prepared.

It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. In as much as a force of 250 lb. is exerted on an 8 inch plug by an internal pipe pressure of 5 psi, it should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous.

As a safety precaution, pressurized equipment shall include a regulator or relief valve set at no more than 10 psi to avoid over-pressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

3. All manholes will be tested using the negative air pressure test (vacuum) in accordance with ASTM C 1244-93 or latest edition for watertightness, and manhole will be visually inspected after backfilling. Contractor may backfill before testing with the understanding that any repairs will be made from the exterior of the manhole.

Manholes shall be vacuum tested and shall have 10-inches of mercury applied to the manhole and the time measured for the vacuum to drop from 10-inches to 9-inches of mercury. Vacuum equipment shall be approved by the local agency and/or Engineer prior to its use. See detail #SEW-10 for minimum allowable test times for manhole acceptance at the specified vacuum drop.

Test times for structures other than manholes will be based on the times for manholes of the nearest equivalent volume or as directed by the Engineer.

Written verification must be furnished that the following steps are followed:

a. The test method is only to be applied to precast concrete manholes.

b. Stubouts, manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn.

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4. Test for leakage of gravity sewers using either the infiltration or exfiltration test:

a. Allowable leakage shall be 50 gallons per inch of pipe diameter per mile per 24 hours up to a maximum of 2,400 gallons per mile per 24 hours for gravity sewers greater than 42" in diameter.

b. Use infiltration test when ground water is at least 4 feet above pipe crown along entire length of line to be tested. Plug the pipe at the upper manhole. Install suitable measuring device at the next lowest manhole. Measure the amount of water flowing through the outlet after flow has been stabilized.

c. Ground Water Determination: Use same procedure as "low pressure air test" above.

B. Testing Requirements for Sewer Force Mains:

1. All pressure testing shall conform to the requirements as established for Water Distribution Systems as outlined in Part IV Section 3 of this document.

3.03 MARKERS

In easements and in undeveloped wooded areas, plastic markers shall be installed every 200 feet, and at all manholes, valves, and fittings. Markers shall be as manufactured by Carsonite, Greenline, or approved equal. Exceptions are where sanitary gravity and force main lines are installed in "kept" yards where the property owners may object to the placement of these markers. Contractors will be required to properly install the markers per manufacturer's recommendations, parallel to the sewer line facing roadway, or as additionally directed by the local agency.

3.04 CLEAN-UP

Upon the completion of the installation of the sanitary sewer system and prior to the Owner's final acceptance, sediment and debris shall be removed from the system. The work area shall be restored to its original condition and pavement replaced to the satisfaction of VDOT and/or County.

End of Section

i. Place underground warning tape directly above all water mains, 18" below finished grade. Tape shall be polyethylene tape with a metallic core, 2 inches in width, with the continuous printed message "Caution Waterline Buried Below." Tape shall be Catalog No. 2 WAT as manufactured by the Seton Name Plate Corp. or approved equal.

j. In addition to letter h and i of this section above, all lengths of pipe within a joint restraint system shall have a marker tape (BLUE with text: “Water Restrained Joints”) attached directly to the top of the pipe with duct tape.

C. Installation of Valves, Fittings, and Hydrants:

1. General: Valves, fittings and hydrants shall be set and jointed to the piping system as hereinbefore specified for cleaning, laying and jointing pipe.

2. Valves and Valve Boxes: Cast iron valve boxes shall be firmly supported, centered and plumb over the operating unit of valve. Box cover shall be set flush with the surface of finished pavement or at such other level as may be directed by the Inspector. Valve rod extension with guide shall be required to maintain a distance of 2'-4' from operating nut to top of box. All valves shall be properly restrained.

3. Valve Key Extensions: Valve stem extensions shall be required where the valve-operating nut is installed at a depth greater than four feet (4’).

4. Cross Connections: Drainage branches or blow-offs shall not be connected to any sewer, submerged in any stream or installed in any manner which, in the opinion of the Inspector, will constitute a contamination hazard or cross connection.

5. Hydrants:

Connection to Main: Each hydrant shall be restrained and connected to the main with a minimum 6 inch branch, controlled by an independent 6 inch gate or resilient seat valve.

Setting of Hydrants: When hydrants are set, a drainage pit two feet in diameter and two feet below the bowl of the hydrant shall be excavated. Valves: All valves shall be restrained with a hydrant tee.

The pit shall be filled with coarse gravel or #57 clean stone, mixed with coarse sand, to a level of 6 inches above the weephole. No hydrant drainage pit shall be connected to a sewer. The bowls of all hydrants shall be well braced against unexcavated earth with suitable concrete backing, and when

directed shall be restrained to the pipe with approved harnessing. All hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

6. Anchorage of Fittings: As required in Part V, Section 4 of this document, all fittings, i.e., each bend, tee, plug, valve and cap shall be prevented from moving by means of adequate thrust reaction blocking or mechanical restraints; or both.

7. In easements and in undeveloped wooded areas, plastic markers shall be installed every 200 feet, and at all valves and fittings. Markers shall be as manufactured by Carsonite or approved equal. Exceptions are where water lines are installed in "kept" yards where the property owners may object to the placement of these markers. Contractors will be required to properly install the markers per manufacturer's recommendations, parallel to the water line facing roadway, or as additionally directed by the County.

D. Installation of Fabricated Steel Tapping Sleeves:

1. General: Rigorous testing and conditions relating to tapping sleeves, applied to all manufacturers, is standard operating procedure. These conditions are as follows:

   a. The tapping sleeve shall be tested in place to a minimum of 200 psi, for a minimum of 10 minutes with no loss of pressure.

   b. If the sleeve fails the 200 psi pressure test, the original failed sleeve shall be replaced with an entirely new sleeve.

   c. Tapping sleeves 16" and above shall be supported by a concrete pedestal support, as shown in the County's "Standard Details" Section.

2. Rockwell Tapping Sleeve: In addition to the conditions outlined in Section 1 above, the following procedures must be followed by the contractor:

   a. Clean pipe surface thoroughly, particularly in the area where the gasket will seal. The contractor shall wipe the pipe in the area where the tap is to be made with a 1% chlorine solution prior to installing the sleeve.

   b. Lubricate pipe and gasket with soap and water.

      It is not necessary to lubricate pipe. (See item c. Under no condition should any antifreeze be used.

c. Mount body halves on pipe. Contractor shall ensure gasket is secure in gasket groove.

Contractor shall ensure that the tapping nipple is pointing in its final direction so it will not be moved or rotated on the pipe. This half of the sleeve can be blocked in some fashion so the back half of the sleeve and bolts can be installed without having to have several people involved in attaching the sleeve.

d. Insert bolts and hand tighten nuts, keeping equal gaps between body halves.

e. Prior to tightening nuts, position outlet as required to suit the installation. Contractor shall ensure test connection is accessible.

f. Tighten bolts, alternating from one side to the other to equalize the gap between halves. Continue to tighten bolts until sleeve halves conform to the contour of the pipe and all bolts are to a uniform tightness. The required torque for dry threads will be 70-100 ft. lbs. (Lubricated threads 35-50 ft. lbs.) On thin wall or badly corroded pipe care should be taken to prevent crushing or collapsing of the pipe.

g. A pressure test is required prior to tapping to test the sleeve and valve in place.

Prior to pressure testing, the inspector shall obtain a reading of line pressure in the system, either from a hydrant or a service. The pressure test should be at 2½ times line pressure or 200 psi, whichever is greater. The duration of this pressure test shall be a minimum of ten minutes. If the sleeve fails the pressure test it shall be completely removed and returned and a new sleeve used. The tapping sleeve, valve and tapping machine assembly is to be adequately supported during the tapping operation to prevent movement or rotation of the tapping sleeve.

h. Proceed with tapping operation.

Contractor shall complete tapping procedure and perform the necessary checking as required. Contractor shall furnish the inspector with the coupon.

i. Check the bolts for tightness and retorque if required.

e. Distance between taps or from a joint or bell shall be a minimum of 18"

f. Service pipe shall be type "K" hard copper

g. Services shall be installed with 3'6" minimum cover up to meter yoke where yoke shall be installed so that meter will set 12"-16" from finished grade

h. Meter yokes shall be from approved materials list and be installed with a tail piece of type "K" copper 10"-18" long

i. Meter yoke and box shall be set 1' inside property line or a reasonable distance inside property line in order to install on reasonably level ground

j. On 1½" and 2" services a curb stop shall be installed on inlet side of yoke, 1' from yoke

k. Backfill shall be hand tamped up to service pipe at tap to prevent corporation stop from being broken off during backfilling

G. Installation of Water Mains and Water Meter Boxes as it relates to Sidewalks:

1. Sidewalks must be constructed to accommodate at least a 4 foot horizontal separation between the County’s public water mains.

2. If sidewalks are constructed within the public road right-of-way, the street side of all water meter boxes must be installed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater.

3. If sidewalks are constructed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the street side of all water meters boxes must be installed 3 feet behind the house side of the sidewalk.

4. If the sidewalks are constructed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the water services must be installed within 1 foot outside of the right-of-way line.

3.02 TESTING OF WATER DISTRIBUTION SYSTEM

A. Testing Techniques for Water Distribution System:

1. Each properly isolated section of the piping system including all water services shall be subjected to a pressure test of 150 psi, or 1-1/2 times the working pressure whichever is greater, measured at the high point of the system. Maintain this pressure for a minimum of two hours with an allowable leakage as reflected in the Standard Details Section -Part II. Prior to applying pressure to the lines all reaction blocking, and/or mechanical restraints shall have been completed to the satisfaction of the Inspector. As the pipes are being filled, all air shall be expelled from the pipes by providing suitable taps at the high points of the system. After the system is filled, all taps shall be tightly plugged.

   Any defects discovered during this test shall be repeated until the results are satisfactory to the Inspector. The Contractor shall provide all equipment and materials and perform all labor necessary to conduct the test. The Contractor shall provide a suitable test pump and properly calibrated gauge or other means for measuring leakage to include, a clean 50 gallon barrel with top cut out, etc., which is satisfactory to the Inspector.

2. The County will furnish the water used for flushing, sterilization and testing without charge. Filling of water line may be performed provided permission has been obtained from the Inspector who will be responsible for coordinating this activity with the County's Operations and Maintenance Section. Contractor is not permitted to operate valves on existing lines.

3. Testing shall be performed in accordance with the AWWA Specifications, latest revision.

3.03 DISINFECTION

A. Prior to being placed in service, the pipe line and appurtenances shall be disinfected in general accordance with ANSI/AWWA C651- 92; AWWA Standard for **Disinfecting Water Mains** and the supplemental procedures as set forth below.

1. Section 3 of AWWA C651-92 emphasizes six basic procedures in the disinfection process. The procedures are to:

   a. prevent contaminating materials from entering the water main during storage, construction, or repair;

   b. remove, by flushing or other means, those materials that may have entered the water main;

   c. chlorinate any residual contamination that may remain, and flush the chlorinated water from the main;

   d. protect the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures;

   e. determine the bacteriological quality by laboratory test after disinfection; and

   f. make final connection of the approved new water main to the active distribution system.

2. Preliminary Flushing:

   The main shall be flushed prior to disinfection at a velocity of not less than 2.5 Ft./Sec. unless the owner determines that conditions will not permit the required flow. See Table 1, entitled "Flushing Schedule". Adequate provisions shall be made by the contractor for disposal of flushing water so that no physical or environmental damage results. Contractor will find additional instructions on flushing in the supplemental procedures within this section.

3. Forms of Chlorine for Disinfection:

   It is the contractor's responsibility to be familiar with and have available for his employees the "Product Data Safety Sheets" of any products used as a source of chlorine and to provide the proper safety instructions and personal protective equipment to the employees mixing and using materials for disinfection of the water facilities.

   a. Acceptable sources of chlorine for disinfection may be obtained from any of the following three sources:

      1) Liquid sodium hypochlorite (household bleach)
      2) Liquid sodium hypochlorite (industrial strength)
      3) Calcium hypochlorite granules

b. Only under extreme conditions and with the written approval of the owner and under the direction of a holder of a State of Virginia Class III (or higher) water works operator's license can chlorine gas, regulated through proper metering equipment, be mixed with water to obtain a suitable disinfecting solution.

c. The direct introduction of chlorine gas (or liquid) from a pressure cylinder into a water line is not safe and shall not be allowed.

d. The use of calcium hypochlorite pills affixed to the interior of water pipe for disinfection shall not be an acceptable form of disinfection.

e. The mixing of a source of chlorine to obtain a suitable disinfecting solution shall be as follows:

1) Liquid sodium hypochlorite is supplied in strengths from 5.25 percent available chlorine (commercially available household bleach) to 15 percent available chlorine (industrial strength sodium hypochlorite). A water-sodium hypochlorite solution shall be prepared by adding liquid sodium hypochlorite to water.

2) A water calcium hypochlorite solution shall be prepared by dissolving calcium hypochlorite granules containing 65% available chlorine by weight in a pre-determined volume of water to make the desired water-calcium hypochlorite concentration. Disinfection of new mains by water calcium hypochlorite solution shall not be used unless a suction or in-line strainer is available on the solution pump to prevent any undissolved solids from entering the piping. An alternative method of straining the solution to remove undissolved granules may be approved by the inspector on a case by case basis.

3) A water-chlorine gas solution may be used only when suitable equipment is available and shall be done under the direct supervision of a person familiar with the physiological, chemical, and physical properties of this element and who has a State of Virginia Class III or above water works operator's license and is properly trained and equipped to handle any emergency that may arise.

4) The direct introduction of chlorine gas (or liquid) from a pressure cylinder into a water line is not safe and shall not be allowed.

4. Method of Chlorine Application and Testing:

a. The continuous feed method of applying the disinfecting solution shall be as follows: Water from the existing distribution system or other approved sources of potable water supply shall flow through an approved flushing mechanism (Standard Detail WAT-6) at a constant, measured rate into the newly-laid pipeline. The water shall be mixed with a chlorine-water solution as prepared above, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration of the water and water/chlorine solution in the pipe is elevated to and maintained at, a minimum of 50 mg/1 available chlorine.

Since the forms of preparation for a water sodium hypochlorite or water calcium hypochlorite concentration are a batch process, a method acceptable to the inspector shall be available to replenish the concentration being fed and mixed with the water flow, so there is no interruption of the flow of disinfection solution.

To assure that this concentration is maintained, the chlorine residual shall be measured at intervals not exceeding 2,000 feet and at the end of all branch lines or cul-de-sacs in accordance with the procedures outlined herein. During the application of the chlorine-water solution, valves, hydrants and any other appurtenances shall be operated in order to be thoroughly disinfected. Chlorine-water solution application shall continue until the entire new main is filled with water having a residual of a minimum of 50 mg/1 chlorine solution. The chlorinated water shall be retained in the main for at least 24 hours.

b. The Owner will furnish the personnel and equipment for determining water-chlorine solution strengths and residuals.

c. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine residual of the water leaving the main is equal to the chlorine residual of the incoming system water. At that time, the new system shall be valued off and

bacteriological testing shall begin as indicated in Section 3.03.B. Additional instructions for disposal of the heavily chlorinated water is covered in Section 3.04.E, entitled "Flushing".

B. Bacteriological Tests:

1. After final flushing, and before the water main is placed in service, samples shall be collected and tested for bacteriological quality as follows:

   a. If total chlorine is 1.5 mg/L or less: Begin bacteriological testing at 24 hours after final flush.

      1) Test for total and fecal coliform for 2 consecutive days. Both test samples must be less than 1 colony/100 ml.

      2) Test for heterotrophic plate count on 2nd day. Test sample must be less than 500 colonies/ml.

   b. If total chlorine is greater than 1.5 mg/l: Wait 5 days or until residual drops to 1.5 mg/1 or less, whichever is sooner, then test.

      1) Test for total and fecal coliform for 2 consecutive days. Both test samples must be less than 1 colony/100 ml.

      2) Test for heterotrophic plate count on 2nd day. Test sample must be less than 500 colonies/ml.

      Samples shall be collected at least 24 hours apart at intervals determined by the Inspector (not exceeding 2,000 feet apart and at the end of all branch lines and cul-de-sacs) and tested by the County of Chesterfield laboratory and the results submitted to the Owner.

2. Samples for bacteriological analysis shall be collected in approved sterile bottles or bags treated with sodium thiosulfate provided by the County laboratory. If laboratory results indicate the presence of coliform bacteria, the samples are unsatisfactory and disinfection shall be repeated as prescribed above until the samples are satisfactory. Cleaning, disinfection and testing shall be under the direction of the Inspector but remains the responsibility of the Contractor. Water for these operations will be furnished by the Owner, but the Contractor shall be responsible for any cost associated with the loading, hauling, and discharging of the heavily chlorinated water.

3.04 SUPPLEMENTAL PROCEDURES FOR DISINFECTING, TESTING, AND FLUSHING

A. GENERAL:

1. All work shall be performed in general accordance with AWWA C651-92.

2. The supplemental procedures are developed to compliment the AWWA C651-92 Standard, particularly with respect to flushing, testing and tie-in to the existing water distribution system.

3. These procedures and construction acceptance for final tie- in of a new water main are performance based, predicated on the new construction passing pressure and bacteriological testing. In order to best assure satisfactory bacteriological results, it is essential that all aforementioned preventive and precautionary measures be taken prior to and during construction to protect the interiors of pipe, fittings and valves against contamination. Failure to follow the precautionary measures increases the likelihood of unsatisfactory bacteriological tests and increases the construction requirements necessary for final acceptance. Refer to AWWA C651-92, Section 4, entitled "Preventive and Corrective Measures During Construction".

4. No contaminated material or any material capable of supporting the growth of microorganisms or causing taste, odor, or other aesthetic water quality concerns shall be used in sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation or sealing gaskets shall be Blue Lube or Slikstyx pipe gasket lubricant. Blue Lube Slikstyx are the only pipe joint lubricant for such use. It shall be kept clean and applied clean with dedicated applicators.

   (Note: Use of any unapproved lubricant other than Blue Lube or Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions as a result of the use of unapproved lubricants.)

5. Table 1, Flushing Schedule gives flushing flow rates and flushing mechanism sizes for water mains 6" through 24" in diameter. Specific flushing schedules for line sizes above 24" will be project and site specific and directions will be given on the project drawings.

B. Filling and Testing Procedures:

1. Connection of the new water main to the existing distribution system for filling and testing shall be through a contractor furnished flushing mechanism as shown on Standard Detail WAT-6 of these specifications and sized as noted in Table 1, entitled "Flushing Schedule". The contractor is to furnish the single gate valve, double check valve flushing assembly and all necessary fittings, reducers, increases and sleeves to make the piping connections. A suitable valued piping arrangement for the additions of the water-chlorine solution is to be available on the new line side of the flushing assembly. The assembly is to be furnished with 125 psi rated flange connections and installed in a manner approved by the Inspector.

2. Initial flush time is to be in accordance with Table 1, entitled "Flushing Schedule".

3. Pressure test the line as noted in Section 3.02, A.1 of these specifications.

4. Make any necessary repairs and pressure test again until the line passes this test.

5. Disinfect the line in accordance with AWWA C651-92, Section 5. A water-chlorine solution prepared in accordance with Section 3.03, A.3 above shall be used for disinfection.

6. Bacteriological samples will be taken by the County in accordance with AWWA C651-92, Section 7.

7. If unsatisfactory bacteriological test results are received, repeat steps 2, 5 and 6. Where only an unsatisfactory heterotrophic plate count is received, steps 2 and 6 need only be repeated at existing residuals.

8. After receiving satisfactory bacteriological test results, the contractor shall coordinate with the Inspector the connecting of the new main to the existing system. All connecting pipe and fittings shall be clean and free of debris and shall be swabbed or sprayed with a 1 percent sodium hypochlorite solution before they are installed. The contractor shall tie-in new water lines to the existing water system within 10 working days of successful completion of all bacteriological tests, otherwise the disinfection process must be repeated.

9. Final flush of line to be in accordance with Table 1, entitled "Flushing Schedule".

C. The Disinfection and Supplemental Procedures as covered in sections 3.03 and 3.04 may be modified by the Director of Utilities for site specific problems that do not physically allow for following the normal disinfection procedures. Modified instructions will be given in writing from the Director through the Inspector and will be executed by the Contractor in a manner that does not subject the existing distribution system to undue problems and assures that adequate disinfection and flushing will be given to the new main.

D. The procedure for the disinfection of short leads to fire hydrants and the connector pipe to fire suppression systems/ double check assemblies shall be as follows:

Connector piping, fittings and valves from an existing main to a fire hydrant or to a fire system double check assembly, which does not contain domestic use branches and is equal to or less than eighteen (18) feet in length from the main, may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just prior to installation, tied-in and flushed at a velocity of not less than 2.5 ft/sec. Bacteriological sampling will be taken downstream for confirmation.

E. Flushing:

Water for filling the line and flushing will be supplied by the Owner at no cost to the Contractor. Therefore, the use of water for making the new water line available for service will be as follows:

1. Initial Flush:

See Table 1, entitled "Flushing Schedule". This is to be a high velocity flush through all sections of the new line. Since the large volume of water may have effects on the existing distribution system, the initial flushing is to be done only with the approval of and under the direction of the Inspector. System demands may cause this flushing to be done at times when the existing distribution system demands are low.

Because of the large volume of water to be flushed from the fire hydrants or flushing hydrants, the Contractor must inspect the areas of discharge and provide the necessary equipment or materials to prevent any environmental damage or erosion. Sufficient hose length and termination fittings are to be provided so as to discharge the water into stable, heavily vegetated areas, drainage ponds, storm sewers, paved ditches, etc. The contractor is to be responsible for any damage that may result from flushing.

2. Flush to remove disinfecting solution:

This is a low velocity, low flow, flush through fire or flushing hydrants to remove the disinfecting solution from the new line. In new subdivisions, or in areas where there is an existing sanitary sewer, this discharge may be made into the sanitary sewer system. The Contractor is to provide sufficient hoses to connect from the hydrants to a manhole in a manner that provides a suitable air gap for backflow prevention. In projects where there are no sanitary sewers, the flushing of the disinfecting solution must not enter any streams or be discharged in a manner that causes any environmental damage. For site specific locations the Inspector may require the use of a neutralizing chemical and piping arrangement. (See drawing WAT-10, in Part II - "Standard Details" of these specifications). The expense of a neutralizing station is the responsibility of the Developer/Contractor. The Engineer shall indicate the need for a neutralizing station on the drawing.

3. Final Flush:

See Table 1, entitled "Flushing Schedule". The final flush is a medium velocity, medium flow flush to clear the line of any chlorine solution used in the tie-in and to provide for fresh water throughout the new lines.

TABLE 1

FLUSHING TABLE			
(Nominal) Main Size	Double Check Valve Single Gate Size (Note 1)	INITIAL FLUSH (Note 2)	FINAL FLUSH (Note 2)
		Min. Flow (gpm)	Max. Flow (gpm)
6″	4″	220	88
8″	4″	400	160
12″	6″	900	350
16″	6″	1500	624
20″	8″	2450	978
24″	12″	3525	1410
30″	Designed by Consultant	5505	2202
36″	Designed by Consultant	7935	3174

NOTE: 1) See description of "Preassembled Flushing Mechanism" Section II of the specifications, Detail WAT-6.

2) Approximation of flushing flows can be made by using either a pitot tube or a method of measuring the static discharge pressure from a hydrant used for discharge of the flushing water. See Section II of these specifications, WAT-9 "Discharge Table for Hydrants".

3) On a case by case basis, dependent upon such variables as length of new waterline (<200'); space limitations; or other unforeseeable obstacles, the inspector may authorize the use of a smaller flushing device if the use of this device will provide for adequate flushing of the new waterline.

3.05 TESTING OF DOUBLE CHECK ASSEMBLY

A. The County Inspector will be responsible for insuring the appropriate test is performed up to the OS&Y gate valve located on the inlet side of the double check assembly.

B. The Fire Department will be responsible for insuring the appropriate tests are performed from the OS&Y gate valve located on the inlet side of the double check assembly to the building including the sprinkler system.

C. The Developer is responsible for having the double check assembly tested by an approved tester prior to service being authorized to the building. Tests on the double check assembly will be conducted on an ongoing basis annually by a certified tester approved by the Cross Connection Control and Backflow Prevention Office of the Chesterfield County Department of Public Utilities. The results of the test will be sent to the Backflow Prevention office and forwarded to the proper departments.

3.06 ABANDONMENT OF WATER SERVICE

Excavate at the main and expose the corporation stop. Turn off the corporation stop and disconnect the copper tubing from the corporation stop. Assist the Inspector in referencing the location of the corporation stop for County records. Remove the meter box, yoke and service line. The Inspector will turn in the meter to the Operations and/or and Maintenance Center. When existing water services are to be abandoned as a part of a utility project, the Utility Contractor shall review the scope of the work with the Utilities Inspector and then proceed to abandon those services prior to any other work commencing.

3.07 ABANDONMENT OF WATER MAINS

Water mains and hydrant laterals to be abandoned shall be permanently disconnected from the remaining system. If the abandonment takes place at a tee, the tee shall be removed from the main and straight pipe installed. For other instances involving fittings, the proper fitting shall be installed to eliminate the previous connection.

All open ends on abandoned pipe to be permanently sealed by plugging with masonry and/or mortar or plug. All valve boxes, fire hydrants, flushing hydrants (blow-offs) or other appurtenances to be removed. Salvageable fire hydrants are to be returned to the County's Utilities Operations & Maintenance Section.

3.08 CLEAN-UP

Upon the completion of the installation of the water system and prior to the owner's final acceptance, sediment and debris shall be removed from the system. The work area shall be restored to its original condition and pavement replaced to the satisfaction of VDOT and/or County.

End of Section

ADDENDUM

JANUARY 1, 2006

CHANGES TO PART V

DEPARTMENT OF PUBLIC UTILITIES
CHESTERFIELD COUNTY
APPROVED
MATERIALS LIST

(Minimum Criteria: Meets AWWA and/or ASTM Standards and Chesterfield County Design Standards, Latest Revisions)

SECTION 1: WATER SYSTEM

A. Pipes

1. C-900 or C-909 - P.V.C. (DR-18, CL. 150) (Sizes 6″, 8″ & 12″)

2. a. Class 51 minimum or higher classification depending upon design consideration. (Push-On and Mechanical Joint) (6″, 8″, 12″, 16″, 20″, 24″, 30″ & 36″)

   b. Restrained Joint Pipe (Pipe Application: Use only where mechanical joint pipe is not available or in vertical applications).

      1) Griffin Snap-Lok (6″ – 30″)
      2) American D.I. Pipe Flex-Ring (6″ – 36″)
      3) U.S. Pipe TR-FLEX (6″ – 36″)
      4) Clow Super Lock D.I. (6″ – 24″)
      5) McWane D.I. (30″ – 36″)

B. Valves

1. Resilient Seated Gate Valves (for main sizes 4″-12″ only)

   a. American Flow Control - Series 500
   Gate Valve with Non-Rising Stem (NRS)

   b. Clow R/W Valve

   c. U.S. Pipe - Metroseal 250: with non-rising stem (NRS) and outside stem yoke (OSY)

   d. M&H (Style 3067-NRS; 3068 OSY)

   e. Kennedy (Model KenSeal II 4571RSGV)

   f. Mueller A-2360 (Resilient Wedge)

   g. American Flow Control - Series 2500 (Resilient Wedge)

   h. American R/D – Series 2000 (Resilient Wedge)

2. Butterfly Valves (For Use on 16″ and Larger Lines)

   a. Mueller - Lineseal III

   b. DeZurik Baw AWWA

   c. Pratt's Groundhog Class 150B and Triton HP-250

   d. M&H Style 4500 (for 16″-24″)
      and Style 1450 (for 30″-54″)

   e. Mosser Series 810 & 830

   f. Rodney Hunt Streamseal (24″ and Larger)

   g. K-Flo 47 Series (30″-72″)

C. Fire Hydrants

1. Mueller Centurion A-421

2. Kennedy “K81D” (Dual rotated hydrant)

3. M & H Style 929 Reliant

4. U.S. Pipe - Metropolitan 250 (Model 94)

5. Clow Medallion

6. American Darling - Mark 73-2

D. Meter (Setters) Yokes

1. For 5/8″ Meters:

   5/8″ x 7″ Riser Meter Yoke with one lockwing ball or plug type, full port angle meter stop, with saddle nuts, ¾″ copper tube flare or compression connection inlet and outlet.

   a. Ford

      1) V71-7W-22-33 (plug type angle stop with copper flare connections inlet and outlet)
      2) V71-7W-44-33G (plug type angle stop with compression connections inlet and outlet for copper pipe)

b. McDonald

1) 29B412WWCC443
2) 29B412WWTT443 (with compression connections inlet and outlet for copper pipe)

All Other Users i.e. for Irrigation, Residential, Etc.

1″ x 12″ Riser Meter Yoke with 1 lockwing ball or plug type angle stop on inlet only, saddle nuts, copper tube flare inlet and outlet. No bypass.

a. Ford

1) V74-12W-22-44
2) V74-12W-44-44G (with compression connections inlet and outlet for copper pipe)

3. For 1½″ and 2″ Meters (Businesses, etc. with bypass):

*a. Ford - for 1½″ Meter - VBB76-7B-11-66
and for 2" Meter - VBB77-8B-11-77
*b. Mueller (for both) - H-1423
*c. A.Y. McDonald - Model 20A609 WWFF 665 for 1½″ meter, Model 20A709 WWFF 775 for 2" meter

For 1½″ and 2″ Meters (residential and irrigation with no bypass):

*a. Ford – for 1½″ Meter – VBB76-7-11-66 and
for 2″ Meter – VBB77-8-11-77
*b. A.Y. McDonald – for 1½″ Meter – 20-609 WWFF 660
for 2″ Meter – 20-709 WWFF 770
*c. Mueller (for both 1½″ and 2″) - #1422-00

*These products are acceptable provided manufacturer makes the necessary modifications to comply with the County's materials specifications for 1½″ and 2″ water meter setters.

E. Corporation Stops - Plug Type only for ¾″ and 1″; Plug Type or Ball Valves for 1½″ and 2″

(¾″ thru 2″ with "cc" thread inlet)
1. Mueller

a. H-15000
b. H-15008 (¾″ and 1″ corp stop with compression outlet for copper) or

4.	Cambridge Brass 1½″	202-H6H6	202-F6F6
	Cambridge Brass 2″	202-H7H7	202-F7F7

F. Vaults, Precast Concrete - Requirements and configurations as shown on plans. (For other approved vaults, see "Water Meter Boxes" under Section 1).

1. Americast

2. Elite Fire Protection, Inc.

3. Tindall Vaults

4. Clear Flow Company

5. M&B (Model MB1500BF/WM with only the Ames 2000 series backflow device and Fire Protection Check Valve – Fig. 590F as manufactured by Grooved Sprinkler Company).

6. Bartow

G. Tapping Sleeve - Sleeves must conform to County's latest application instructions as specified in Section 4 entitled Materials Specifications.

1. **(Fabricated Steel Sleeves)** with Epoxy Coating and Stainless Steel Bolts and Nuts

   a. Smith Blair Model #622 w/MJ Branch (4″-30″)
   b. J.C.M. Industries #412 ESS (4″-48″)
   c. ROMAC # FTS 420 SS (4″-30″)
   d. Ford FTSC (4″-30″) w/SS bolts

2. **(Stainless Steel Sleeves)**

   a. Power Seal - Model 3480 AS and 3480 MJ (6″-24″)
      Model 3490 AS and 3490 MJ (6″-24″)
   b. ROMAC SST and SST III (6″-24″)
   c. Ford FAST (6″-24″)
   d. Cascade - Model CST-EX (4″- larger)
      Model CST-SL (4″-24″)
   e. JCM Model 432 (6″-24″)
   f. Mueller H304 (6″-24″)
   g. Dresser Style 630 (6″ – 12″)
   h. Smith-Blair Models 662 & 663 (4″-20″)
   i. Mueller H300 (Not to be used on Asbestos Cement and Cast Iron Pipe)

3. **(M.J. Steel Sleeve)**

   a. JCM 414 Mechanical Joint
   b. Smith-Blair Model 623 (4″-48″)

4. **(M.J. Cast/Ductile Iron Sleeve)**

   a. Mueller (H-615 for 4″-24″ on Ductile Pipe and H-619 for 4″-12″ C/A Pipe)

   b. Clow (F-5205)

   c. American Flow Control - (Model 2800-A for A/C pipe; Model 2800-C for 4″-12″ D.I. and PVC pipes; Model 1004 for PVC pipe and 16" and larger D.I. pipe)

   d. U. S. Pipe D.I. T-9 MJ Sleeve

H. Resilient Seated Wedge Tapping Valves

1. American Flow Series 500 Resilient Wedge Valve (for 6″-12″ only)

2. Mueller T-2360 Resilient Wedge Valve (for 6″-12″ only)

3. American Flow Control - Series 2500 (for 16″-30″ only)

4. Kennedy Model #4950 (for 4″ and 24″ only)

5. Clow Model F6114 (for 16″ and 20″ only)

6. American R/D – Series 2000 (Resilient Wedge)

I. Fittings (Bends, Crosses, Tees and Grade Lok Offset Glands) Ductile Iron only

1. D.I. Compact AWWA C153 or D.I./C.I. AWWA C110

2. D.I. Special Coated Compact Fittings AWWA 153

Couplings (For pipe sizes 12″ and smaller)

1. Cast Couplings (transition or straight)

   a. Romac 501 series (long sleeve coupling)

   b. Ford #FC2A (long sleeve coupling)

   c. Smith Blair (Rockwell) #442 (long sleeve coupling)

5. Cascade - Styles CNS2 (for 12″ and smaller pipe), and CDSLD (large diameter saddles for 16″ and larger pipe)

6. Mueller - Model DRS2 (with double straps for 2″-12″)

Q. Pipe Restraints (must be UL Listed and FM Approved)

1. For PVC Pipe (Sizes up to 12″)

   a. Megalug Series 2000 PV (PVC Pipe - MJ Fittings)
   Megalug Series 1500 (PVC Bell and Spigot Joints)

   b. Romac Style 611 (PVC Bell and Spigot Joints)

   c. Uni-Flange Series 1390-C (PVC Bell and Spigot Joints)
   Uni-Flange Series 1500 (PVC Pipe - MJ Fittings)

   b. STARGRIP Series 3600 (PVC Pipe - MJ Fittings)

   c. AquaGrip Intergral Restraint System for use on the Centurion Fire Hydrants and Mueller RS Valves

   d. SIGMA One-Lok Model SLC

   g. EZ-PVC

2. For Ductile Iron Pipe -

   a. Megalug 1100 Series (MJ Fittings) All Sizes

   b. Uni-Flange Series 1400 Block Buster Wedge Action Retainer Glands (MJ Fittings) Sizes 4″-24″

   c. Uni-Flange Series 1390-C (Bell and Spigot Joints) Sizes 6″–16″

   d. STARGRIP Series 3000 (MJ Fittings) Sizes 4″-48″
   STARGRIP Series 3600 (MJ Fittings) Sizes 4″-12″

   e. RomaGrip Sizes 4″–12″

   f. SIGMA One-Lok Model SLD (MJ Fittings) Sizes 4″–36″

   g. EZ-LOK restraint gland (4″-24″)

   h. Field Lok 350 Gasket for bell and spigot only (4″-24″)

1) Griffin Snap-Lok (6″ – 30″)
2) American D.I. Pipe Flex-Ring (6″ – 36″)
3) U.S. Pipe TR-FLEX (6″ – 36″)
4) Clow Super Lock (30″ – 36″)
5) McWane D. I. (30″ – 36″)

3. HDPE – DR 11 (4″ – 8″ only)

B. Manholes, Precast Concrete (ASTM C478)

1. Hanson Pipe & Products

2. Americast

3. Concrete Specialties, Inc.

4. Tindall Concrete Products, Inc.

C. Frames and Covers

1. Manhole

a. Street Type (MH-1-S)

1) Neenah Foundry
2) Capitol Foundry
3) Sigma Corporation
4) East Jordan Iron Works
5) FasTech

b. Watertight

1) Capitol MH 1-S/WT
2) East Jordan Iron Works
3) FasTech

D. Fittings (Gasketed) - Gravity

1. Concrete

a. Circular Reinforced (ASTM C76)

1) Hanson Pipe & Products

b. Kor-N-Tee

c. Inserta Tee

DUCTILE IRON PIPE

MANUFACTURERS:

1. Griffin Pipe Products (804) 845-8021
   Box 740
   Lynchburg, VA 24505

2. Atlantic States Cast Iron Pipe Co. (908) 454-1161
   183 Sitgreaves FAX (908) 454-1026
   Phillipsburg, NJ 08865-3052

3. American Ductile Iron Pipe
   (MANUFACTURES PUSH-ON & RESTRAINED JOINT PIPES)
   A Division of American Cast Iron Pipe Co. (412) 851-1230
   2581 Washington Road FAX (412) 851-1243
   Suite 220 & 222
   Pittsburgh PA 15241

4. U.S. Pipe & Foundry Company (410) 879-3556
   1212 Churchville Road, Suite 101 FAX (410) 879-0873
   Bel Air, MD 21014

MECHANICAL JOINT FITTINGS

MANUFACTURERS: (Ductile Iron Compact or Non Compact Fittings)

1. Griffin Pipe Products (804) 845-8021
   Box 740
   Lynchburg, VA 24505

2. Tyler Pipe & Foundry Utilities (214) 882-5511
   P.O. Box 2027
   Tyler, TX 75710

3. Union Foundry (800) 633-2442
   P.O. Box 309
   Anniston, AL 36202

5. SIGMA Corporation (609) 758-0800
700 Goldman Drive, P. O. Box 300 (800) 999-2550
Cream Ridge, NJ 08514 FAX (609) 758-1158

6. Mueller Co.
Main Office – Decatur, IL
Water Division (800) 423-1323
Canada – Mueller Canada Inc. (905) 878-0541
E-mail: moreinfo@muellercompany.com
www.muellercompany.com

7. Capital Industries, Inc. (800) 385-1102
7780 Wards Road FAX (434) 821-6036
Rustburg, VA 24588

8. U.S. Pipe and Foundry Co. (205) 254-7442
P.O. Box 10406 FAX (205) 254-7494
Birmingham, AL 35202

MARKERS

MANUFACTURERS:

1. Carsonite International (702) 883-5104
2900 Lockheed Way (800) 648-7974
Carson City, NV 89701

2. Greenline (800) 438-4733
1616 Commerce Drive FAX (800) 232-9872
Stowe, OH 44224-1731

FLUSHING HYDRANTS

MANUFACTURERS:

1. GIL Industries, Inc. (904) 434-3912
P.O. Box 3501
Pensacola, FL 32505

2. The Kupferle Foundry Company (314) 231-8738
813 Hemstead Place (800) 231-3990
St. Louis, MO 63102 FAX (314) 231-2820

CASING SPACERS

MANUFACTURERS:

1. Cascade Waterworks Manufacturing, Inc. (312) 553-0840
1213 Badger (800) 426-4301
Yorkville, IL 60560 FAX (312) 553-0181

MANHOLE RISERS (R), CONES (C) and ADJUSTING RINGS (AR)

MANUFACTURERS:

R,C,AR	1.	Hanson Pipe & Products, Inc. 2900 Terminal Avenue Richmond, VA 23234-1632	(800) 309-1202 (804) 233-5471 FAX (804) 232-1213
R,C,AR	2.	Americast, A Division of Valley Blox, Inc. P.O. Box 432 210 Stone Spring Road Harrisonburg, VA 22801	(800) 548-4586
		Americast, A Division of Valley Blox, Inc. 11352 Virginia Precast Road Ashland, VA 23005	(804) 798-6068
R,C,AR	3.	Concrete Specialties, Inc. 1420 16th. Street N.E. Roanoke, VA 24014	(703) 982-0777 FAX (703) 982-0775
AR	4.	LADTECH, Inc. 244 Woodbridge Lane Lino Lakes, MN 55014	(651) 415-1252 FAX (651) 415-1090
R,C,AR	5.	Tindall Corporation P.O. Box 361 Washington, NC 27889	

MANHOLE FRAMES AND COVERS

MANUFACTURERS:

	1.	Capitol Foundry 2856 Crusader Circle Virginia Beach, VA	(804) 427-9431
	2.	Neenah Foundry P.O. Box 729 Neenah, WI 54959	(414) 725-7000 FAX (414) 729-3682
	3.	SIGMA Corporation 700 Goldman Drive, P. O. Box 300 Cream Ridge, NJ 08514	(609) 758-0800 (800) 999-2550 FAX (609) 758-1158
	4.	East Jordan Iron Works, Inc. P.O. Box 245 Finksburg, MD 21048	(800) 418-3549

C. MANUFACTURERS' REPRESENTATIVES AND/OR SUPPLIERS

1. A & C Utilities Supply Company — (804) 743-1980
   9501 Burge Avenue — FAX (804) 743-3380
   Richmond, VA 23237

2. A.E.W. Enterprises Utility Pipeline Supplies
   480 Collegeville Road — (215) 489-7007
   Collegeville, PA 19426 — FAX (215) 454-9528

3. AVS Associates, Inc. — (301) 833-7676
   P.O. Box 270 — (800) 537-0761
   Glyndon, MD 21071

4. Americast, A Division of Valley Blox, Inc. — (800) 548-4586
   P.O. Box 432
   210 Stone Spring Road
   Harrisonburg, VA 22801

   Americast, A Division of Valley Blox, Inc. — (804) 798-6068
   11352 Virginia Precast Road
   Ashland, VA 23005

5. Aqueous Sales, Inc. — (804) 379-0019
   13630 Hailsham Circle — FAX (804) 794-7499
   Midlothian, VA 23113

6. Chowning Sales Company — (804) 270-2349
   9503 Bonnie Dale Road
   Richmond, VA 23229

7. Coastal Products Company, Inc. — (804) 550-0395
   10962 Richardson Road, Suite F — FAX (804) 550-0951
   Ashland, VA 23005 — E-Mail: Coastal Pro@aol.com
   Attn: Les Thorpe

8. Concrete Specialities, Inc. — (703) 982-0777
   1420 16th Street N.E. — FAX (703) 982-0775
   Roanoke, VA 24014

9. Hughes Supply — (804) 743-8010
   P.O. Box 895 — FAX (804) 520-5496
   Mechanicsville, VA 23111

10. Elite Fire Protection, Inc. — (804) 270-1951
    10926 Bush Lake Lane — FAX (804) 273-9871
    Glen Allen, VA 23060
    Attn: Zane Crook

C. MANUFACTURERS' REPRESENTATIVES AND/OR SUPPLIERS (Continued)

10. Flomec, Inc. (804) 794-6300
10821 Trade Road FAX (804) 794-3564
P.O. Box 35610
Richmond, VA 23235-0610

10. Hanson Pipe and Products, Inc. (804) 233-5471
2900 Terminal Avenue
Richmond, VA 23234

11. Hockett and Associates, Inc. (804) 353-1423
1717 Summit Avenue
Richmond, VA 23230

12. Lewis Supply Co., Inc. (804) 232-7801
101 E. 7th. Street
Richmond, VA 23234

13. MAS Sales, Inc. (919) 996-7770
P.O. Box 1308
Kernersville, N.C. 27285-1308

14. Paramount Agency (757) 498-9029
397 W. Farmington Road FAX (757) 431-9132
Virginia Beach, VA 23454

15. Preferred Sources, Inc. (804) 271-4067
9303 Burge Avenue FAX (804) 271-1028
Richmond, VA 23237

16. Reams & Associates 385-7207
3704 Old Forest Road, Suite E Alt# 385-7842
Lynchburg, VA 24501 FAX 385-7983

17. Soter-Martin & Assoc., Inc. (804) 798-1423
P.O. Box 15233
Richmond, VA 23227

18. RFS & Associates, Inc. (540) 428-4440
5401 Flycatchers Court FAX (540) 428-4442
Warrenton, VA 20187

21. SPC Marketing — (704) 283-8554
P.O. Box 675 — FAX (704) 283-8010
Monroe, NC 28111

22. Tindall Concrete Products, Inc. — (800) 849-4521
3076 N. Blackstock Road — (864) 576-3230
P.O. Box 1778 — FAX (864) 587-8828
Spartanburg, SC 29304

23. USA - Utility Sales Associates — (804) 794-4710
P.O. Box 1168 — FAX (804) 794-1397
Midlothian, VA 23113

24. Water Works Supply — (804) 730-9050
8338 Old Richfood Road
Mechanicsville, VA 23111

25. National Waterworks — (804) 749-8281
2388 Lanier Road — FAX (804) 749-4023
Rockville, VA 23146 — Toll Free (800) 474-3878
(formerly A & P, WaterPro, and U.S. Filter)

SECTION 4: MATERIALS SPECIFICATIONS

All products must comply with the Materials Specifications as referenced in Part IV herein, and the Standard Details as reflected in the Department of Public Utilities' Standard Design Specifications and Details Manual. All references to ASTM, AWWA, and other standards shall include latest revisions. In addition, all products must have the approval of the State Health Department prior to the submittal to the PDRC for consideration.

A. WATER SYSTEMS

1. Water Pipe and Fittings:

a. Ductile iron pipe shall meet the requirements of AWWA C151. Pipe shall be thickness Class 51. Pipe shall have cement-mortar lining and a bituminous seal coat conforming to the requirement of AWWA Standard C104. Thickness class shall meet the requirements of AWWA C150. Minimum wall thickness for pipe shall be as follows: 6"-0.28", 8"-0.30", 12"-0.34", 16"-0.37", 20"-0.39", 24"-0.41", 30"-0.47". A minimum of 5% of the pipe furnished shall be gauged for roundness full length and so marked.

b. Pipe fittings shall meet the requirements of AWWA C110 (ductile iron or cast iron) or AWWA C153 (ductile iron compact). All fittings shall be Pressure Class 250. Fittings shall have a cement-mortar lining and a bituminous seal coating or a 6-8 mil (nominal thickness) fushion bond epoxy lining/coating in compliance with AWWA C550.

c. Pipe and fittings shall have either mechanical joint or push-on joint, both conforming to the requirements of AWWA C111. Bolts shall be high strength cast iron having an ultimate tensile strength of 75,000 psi and a minimum yield point of 45,000 psi.

d. Polyvinyl chloride pipe (PVC) 6", 8", and 12" in size shall conform to the requirements of AWWA Specification C-900, with gasket joints, DR-18 Class 150 with iron pipe O.D. Fittings shall be ductile iron or cast iron, Pressure Class 250, with mechanical joints. Additional criteria as set forth by the County of Chesterfield is outlined in Section 4.C.1. entitled "Supplemental Specifications - Additional Criteria for Polyvinyl Chloride Piping for Water and Sanitary Sewer Systems".

e. Gaskets - Gaskets for mechanical and push-on joints shall meet the latest AWWA Specifications. Hemp or jute shall not be used. Gaskets for 8" I.D. pipe and smaller shall be 1/16" thick and gaskets for installation on larger size pipe shall be 3/32" thick.

f. Flame Bolts and Nuts - Flange bolts shall be of the length required for various connections. Bolts shall be of steel and have rough square heads made to American Standard rough dimensions and shall be chamfered and trimmed. Bolts and nuts shall be threaded in accordance with American Standard ASA B1.1-1935 coarse thread series, Class 2 fit.

g. Tracing wire shall be 14 gauge copper wire and used with all PVC pipe.

2. Valves:

a. Resilient Seated Gate Valves

1) All resilient gate valves shall fully comply with AWWA C-509 (3"-12") or C-515 (4"-12"), latest revision.

2) All valves shall be manually operated non-rising stem, equipped with operating nut, for installation in a vertical position, unless otherwise specified, and the valve body shall be ductile iron or high strength cast iron with reinforced flanges.

3) All iron surfaces, internal and external must be coated with a minimum 8 mils thickness of hand applied epoxy or 3-5 mils thickness fusion bonded epoxy.

4) The valve stem shall have an independent stem nut (not rigidly attached to the gate) which allows the gate to flex without stressing the stem.

5) All valves shall have either a bronze stem collar bushing with two O-rings above the stem or a stem collar with one O-ring below and one O-ring above the stem collar.

8. Check Valves:

Check valves shall be of the horizontal swing type; iron body bronze mounted, equipped with weighted lever or spring as specified or shown on the plans.

9. Water Service Assembly for 5/8" Water Meters: All materials for the installation of water services shall be as follows or approved equal:

a. Water meter boxes (for use with all 5/8" and 1" meters) shall be as manufactured by Mid-States Plastics, Inc. for high density polyethylene boxes or approved equal.

The meter box shall be 24" high with a cover and reader lid. The box shall have a 1¼" anti-settling flange on the bottom edge. It shall be made of hi-density polyethylene plastic of one piece, molded construction for durability with dimensions as shown on the standard detail in Part II of this document. The box must have solid walls with an average thickness of no less than .550" and have been tested to withstand a 15,000 lb. vertical load freestanding. The inside color shall be white to reflect light for ease of meter reading and the outside shall be black to protect against UV degradation during prolonged exposure to sunlight i.e. during outside storage. All edges shall be clean an smooth for safety during handling.

The meter box cover shall be one-piece, with reader lid made of cast iron for 5/8" and ductile iron for 1" boxes. One piece cover designed to fit the corresponding opening in the meter box frame and have a square treadplate surface design. "WATER METER" shall be on the reader lid.

The lid dimensions shall be: for 5/8″ box – 15.437″ x 10.125″ with a minimum weight of 17 lbs. and for 1″ box – 11.125″ x 18″ with a minimum weight of 21 lbs. It shall have a minimum thickness of .25", with tensile strength 65,000 psi, yield strength 45,000 psi. The castings shall be made of ductile iron and conform to ASTM A536-80.

b. Water meter boxes used in traveled areas shall be made of cast iron as manufactured by Capitol Foundry or approved equal. Material shall consist of gray iron per ASTM A-48 (latest revision) Class 30.

b. **General:** All 1”, 1½” and 2” meter setters for domestic use at residential homes, condominiums, apartments, townhomes, etc. shall NOT be equipped with a bypass valve. Setters for irrigation uses shall NOT be equipped with a bypass valve. All other 1”, 1½” and 2” meter setters SHALL be equipped with a bypass.

Meter setters for 1" meters shall be 1" x 12" riser meter yokes with copper tube flare nut or compression on the inlet and outlet sides.

All 1 1/2" and 2" meter setters shall be constructed of seamless threaded red brass pipe, standard Type K hard copper tube (per ASTM B-88-62,) high quality brass (per AWWA C-800,) and leadless solder, and provide horizontal female pipe threads on both front and rear connections.

c. **Bypass:** Meter setters that are equipped with a bypass line and valve shall be appropriately sized with an inverted key or ball type stop threaded directly into the inlet bypass tee fitting. This bypass valve shall have a solid tee head and be either lock wing type or provide a bracket or other device to lock this valve in the "off" position upon installation. If copper tube is used for the bypass line, the compression connection for the copper side of the bypass valve must be as produced by the following manufacturers:

Mueller Co., "110" compression connection for copper pipe; or

Ford Meter Box Co., "Grip Joint" connection for copper pipe; or

A. Y. McDonald, "T" compression connection for copper pipe.

Otherwise, a tee head inverted plug or ball type bypass valve is required with a threaded connection. Both of the bypass tee fittings, (inlet and outlet,) shall have brace pipe eyelets cast within them to stabilize setter upon installation, if necessary.

All clamping rings shall incorporate serrations on the inside surface to provide positive restraint on the outside surface of the pipe and shall provide full support around the circumference of the pipe to maintain roundness.

Restraining devices shall have a pressure rating equal to or greater than the PVC pipe, and shall be capable of withstanding a minimum test pressure of 2 times the pressure rating of the device.

Restraining devices and T-bolts shall be manufactured from high strength ductile iron, ASTM A536, Grade 65-45-12. Clamping bolts and nuts shall be manufactured from completely corrosion resistant COR-TEN STEEL or equal.

Restraining devices shall be as approved by Chesterfield County's Product and Design Review Committee.

b. For Ductile Iron Pipe

Mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility and minimal deflection of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Twist-off nuts shall be used to insure proper actuating of the restraining devices.

Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. There shall be no dissimilar metals allowed. Dimensions of the gland shall be such that it can be used with all AWWA approved standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153.53/A21.53 of latest revision. The mechanical joint restraint device shall have a working pressure of at least twice the working pressure of the pipe.

All bell and spigot end joints within this length shall be restrained with an approved bell and spigot restraint device. Clamping ring restraint devices require an additional ring be designed to fit behind the bell end of the D.I. pipe. The rings shall be connected with T-Head Bolts or Rods. Rods must be protected from corrosion either by rod material or coating.